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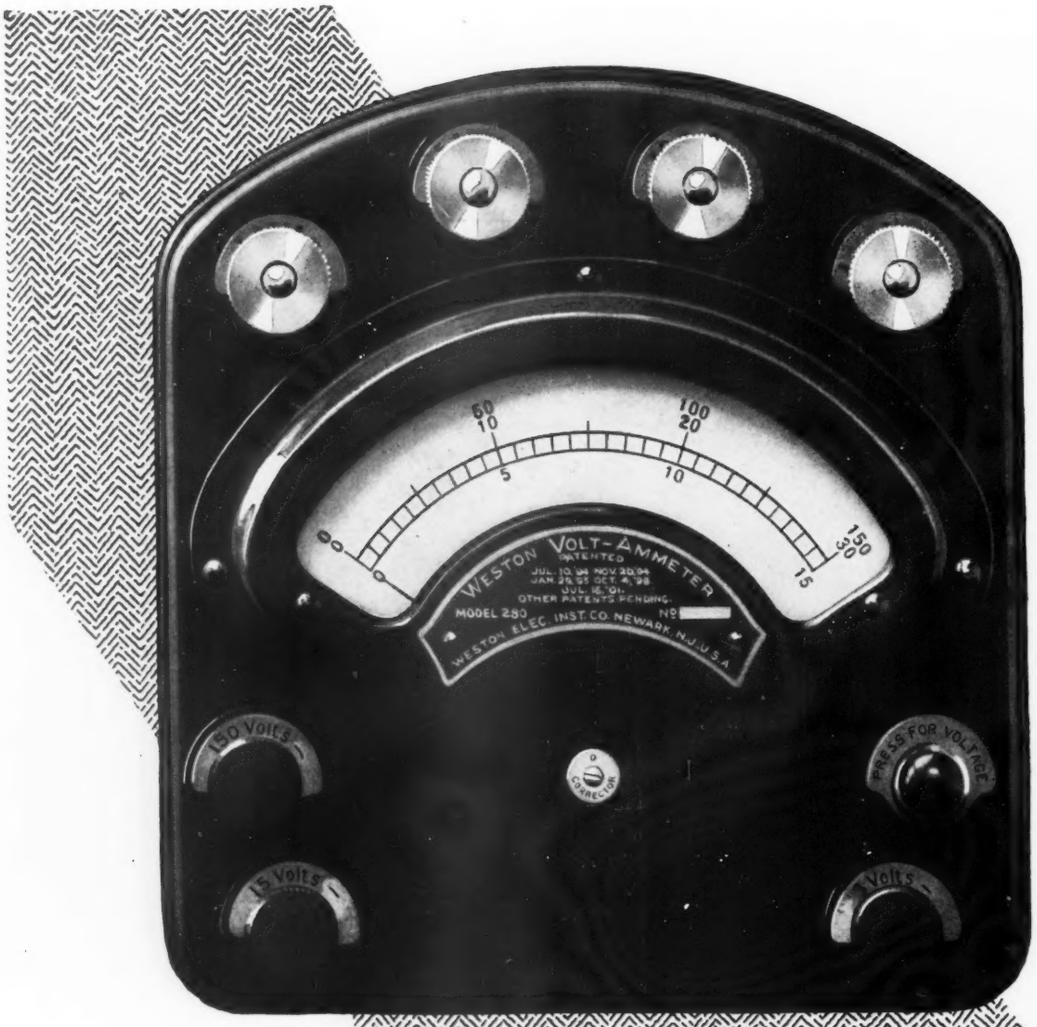

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Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

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Electrical World

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The Spirit of Discontent

SURELY these are days of discontent. Nation wars against nation, people against people, system against system. In fact, society seems to be in a state of turmoil, and interest in all forms of organized work is hard to maintain. Our great political parties are rent with dissension, labor and capital are as far apart as ever, systems of collegiate instruction are all upset, our national engineering societies are at their wits' end to interest their members, clergymen face empty benches, and nothing seems to satisfy. Such a condition of affairs may be healthy or detrimental, depending on how the issue is met. Properly directed, the spirit of discontent may lead to higher, nobler and better things; misdirected or ignored, it may terminate in social chaos and utter disorder. If we have robbed the world of anything contributing to its happiness and well being, we must find something better to take its place, and that quickly.

There is no better evidence of a man's belief in the fair administration of a public utility than his willingness to put his money into its securities, and no better security for square dealing as between the utility and the people. The idea of a public service corporation as a public trust with direct moral responsibility to those whom it serves has never been more strongly enforced than by campaigns to take consumers into partnership. Besides, the larger the number of consumer-stockholders the better the evidence of the closeness of a public utility to the community.

A "Pull Together" Conference

IN THE large convention to be held next week at Atlantic City under the auspices of the United States Chamber of Commerce the business men of the great industries of the country have their first good opportunity to formulate the general reconstruction policies which they feel necessary for the welfare and prosperity of the nation. If what is done at the important conferences planned there is based on a broad and fair conception of the rights and interests of all parties concerned, it will serve to crystallize a now uncertain public sentiment into definiteness, so that effective results may grow from it. It will be of most value as it presents the desire for sincere coöperation between industry, capital and the government authorities who are wielding a vast measure of control over all affairs in this juncture. It is a time when big deeds, the world-wide vision, are needed but in carrying them on to realization the helpful aid of every element in the country is needed in a hearty "pull together," with no one lagging but every one doing his share.

War-time restrictions on production have proved to be blessings whose effect on the future of industry cannot now be fully estimated. Capital has been conserved, material saved, labor released and sales and distribution problems simplified. Moreover, industry is perfectly satisfied with the change, and there are indications that hysterical competition will never again make itself known. For such achievements many thanks.

Demand Meters

IN ANOTHER column C. F. Mathes brings to the front from the standpoint of a practical meter man the present status of the demand meter. There are some useful indicating meters of this type on the market, especially well adapted for a certain proportion of the work of a central station; but as a strictly practical matter many requirements are insufficiently met even now. If one merely wishes to know the maximum power called for by any consumer, the facts are ascertainable with comparative ease. This crude form of demand reckoning has, however, very serious faults. Of course, at best the actual maximum demand is an indication of only one factor, and not always the most important one, in the requirements of the consumer. In many instances the time of the demand and the continuance of the maximum demand period are very much more serious factors in a proper demand charge than the actual maximum.

There are several types of curve-drawing instruments which meet the requirements fairly well, but they are expensive and require considerable attention. Mr. Mathes points out clearly the practical difficulties encountered in attempting to use on any considerable scale instruments of this class. Perhaps the fundamental trouble is that they belong rather to the category of laboratory apparatus than to that deliberately fitted for permanent use on distributing circuits, which is an entirely different problem. Just how far it is desirable for a supply company to go into the use of a system of charging which requires meters of this class is perhaps a dubious matter. One cannot altogether avoid the feeling that the demand system is a thing for special rather than general application and that the present tendency toward simplification of rates should be encouraged, rather than

the addition of intricacy up to the point where highly specialized and somewhat troublesome apparatus is required to do the work.

Gloom no longer pervades our streets. Our signs and windows once more blaze forth with welcome light, and the whole country rejoices in the removal of the ban that kept them so long darkened. What an impressive tribute to electricity our "white ways" are!

Improvements in Distribution

THE paper by S. Bingham Hood on the rearrangement of electrical distribution in Minneapolis points a moral worth the consideration of many a station manager. For years past the general and especially the residential load in the city had been steadily increasing, and with it came the usual story of installing more copper and more transformers, changing feeders and taking other steps to improve the distribution. Such changes, as is always the case, were merely symptomatic in character, effecting some improvement but not reaching the root of the trouble. Finally the time came when something had to be done, especially in the residential district. The existing system was one built up from 2300-volt single-phase feeders and mains serving the lighting and small motor load. It also included some 2300-volt three-phase feeders supplied from the general 13,200-volt main system. Gradually the usual thing happened. Regulation went from bad to worse and automatic regulators reached their capacity. At last, after careful study of the situation, the distribution was changed over to a 2300-volt star-connected system with a common neutral. On the secondary side the lines were interconnected throughout each phase section much as in ordinary direct-current networks.

The additional feature of a somewhat unfamiliar character found on this system is use of the common neutral as between primary and secondary. Both primary and secondary neutrals would be grounded to meet ordinary requirements, and if well grounded would be kept at earth potential. In a properly designed system neither carries much current and their union in the way plainly shown in Mr. Hood's article involves no particular difficulties. The engineer will find the study of the details here disclosed of very great interest, showing the extremely practical way in which the three-phase, four-wire system may be made to do the full duty required of it with a minimum of trouble and expense and greatly improved regulation. Mr. Hood states that the saving on the primary mains was 50 per cent. There was additional gain in the power circuits, and by grouping the power banks of transformers the fullest advantage could be taken of the diversity factor. In one instance eighteen transformers aggregating over 200 kva. were replaced by three 30-kva. units. The saving in transformers has been an important addition to the saving in copper. The regulation has been greatly improved and the reliability of the installation in all respects materially increased.

It is curious how long it has taken for the Y-connected three-phase distribution with neutral to come into its own. It is one of the most flexible and valuable distribution systems known and its disadvantages are mostly imaginary. There are scores of plants in the country which would gain great advantage from its adoption, and we trust that Mr. Hood's telling account of the Minneapolis work will encourage other engineers to follow his example.

Economies almost unbelievable were effected in the operation of public utilities during the war. Though loads increased fuel was saved, and where water power was utilized to the limit coal shortage was mitigated. Refined in the furnace of affliction, central stations are more firmly established than ever. Let them now set an example of unselfish service for industry and the public welfare.

New England Transmission Networks

WE RECENTLY described the interconnection of a large group of plants in Connecticut with incidental connections outside. In the current issue we present some interesting details of the situation in Massachusetts, and especially around Boston, as disclosed by an A. I. E. E. paper of L. L. Elden, electrical engineer of the Boston Edison company. The accompanying map gives at a glance the general situation. The starting point of the general power distribution from the hydroelectric end is the system of the New England Power Company, with its main station at South Vernon, Vt., and several important subsidiaries. From the steam end of the situation the Boston Edison company, with an output of something like 300,000 kw.-hr. per annum, occupies the center of the stage. It is the result of the gradual absorption and connection of something like forty plants. An interconnection is now being built between the Boston system and the lines of the New England Power Company at Clinton, thus enabling useful exchange of power at this point. Further, the New England Power Company is about to be connected with the system of the Shore Line Electric Railway Company at Norwich, Conn., and there are immense opportunities for the addition of further linkages stretching from Newport to Portsmouth, N. H. As yet much remains to be done to complete any such north and south interconnection, but it is a logical necessity of the power situation and sooner or later will be accomplished.

There seems comparatively little opportunity in this territory of largely increasing the water-power development in such sense at least as will cut down greatly the need for steam. The Turners Falls company is a big addition to the hydroelectric capacity, but it has already established a considerable steam station recently described in our columns, and the whole hydroelectric power in Massachusetts and Connecticut scarcely exceeds 125,000 kw., only a modest proportion of the total demand. This situation renders the need of interconnection imperative for the full utilization of the water power and for the maximum benefits to be obtained from the diversity factor. This latter is a large item in the situation, and Mr. Elden estimates that on the immediate south side of Boston alone there is a

diversity in peak loads of some 5000 kw. For the complete utilization of the natural resources in water power and their reinforcement by cheap steam power the fullest measure of interconnection should be secured at the earliest possible moment.

Profits on manufacturing operations this year are not all fat. They must be calculated with a weather-eye open for the visit of the tax collector next year. What a relief it will be to have the war costs move some day into the hazy past and leave the way open for a profit that can be figured in advance with reasonable accuracy!

Government Operation in Politics

THE essential fact is that government operation of public utilities on a large scale was started in this country as a pure war measure. With the patriotic public spirit sweeping all classes of people there was no disposition to withhold any military aid which the Washington authorities wanted. Truly, they had but to ask and it was given to them. There has been no stint in what the nation stood ready to offer in order that righteous victory might be won for our cause. Were it lives or property, the country as a whole surrendered personal liberties and rights with a willing heart for the benefit of the national aim. That was as it should be; there is no complaint to make over what was done in a noble cause. Events moved rapidly, and then we had the President's historic words addressed to Congress: "The war thus comes to an end." And, taking his message as the mark of a new era, industries began steps to get established on the changed basis which peace means. It was and is still a critical time to weigh policies, national and individual, as they affect the prosperity and welfare of all. One of the most vital of these, which touches the very roots of our governmental and industrial life, is that of public ownership or operation of great utilities. Whether it is presented as private ownership with public operation, public ownership with private operation, or public ownership and public operation, is not so important as it is that there be an economically just decision on the question of whether public or private agencies will render the better service at the lower cost.

But will the question be decided on economic grounds? Centainly in the present situation it is in the fore as a controversial political issue and promises so to continue. It is difficult to put any other interpretation upon recent events at Washington. The authorities are operating the carriers, the telegraph and telephone systems, and they appear to want to strengthen and extend their control over the operation of these properties. This is illustrated most clearly by the Postmaster-General's act in taking over the cable systems and by his decision to combine the two competing telegraph systems, supplemented by the announced desire that the radio systems shall be brought under government control. The members of the Cabinet move with hasty step to tighten their hold on the classes of privately owned properties whose control they were given for war purposes. If the war is at an end—and the clean stripping of our enemy's military and naval resources confirms the President's conclusion—why should it be necessary to do anything but return these properties to their owners? They were taken for a purpose as specifically intended and described as anything on earth could be—they served that purpose; now they should revert to those from whom they were taken. If government ownership or operation is to be the issue, the agitation of that issue should be begun, not when the government holds a control secured by the aid of the warm patriotic fervor which moved the nation, it should be begun after the spirit of the law has been fulfilled, after the properties have been surrendered.

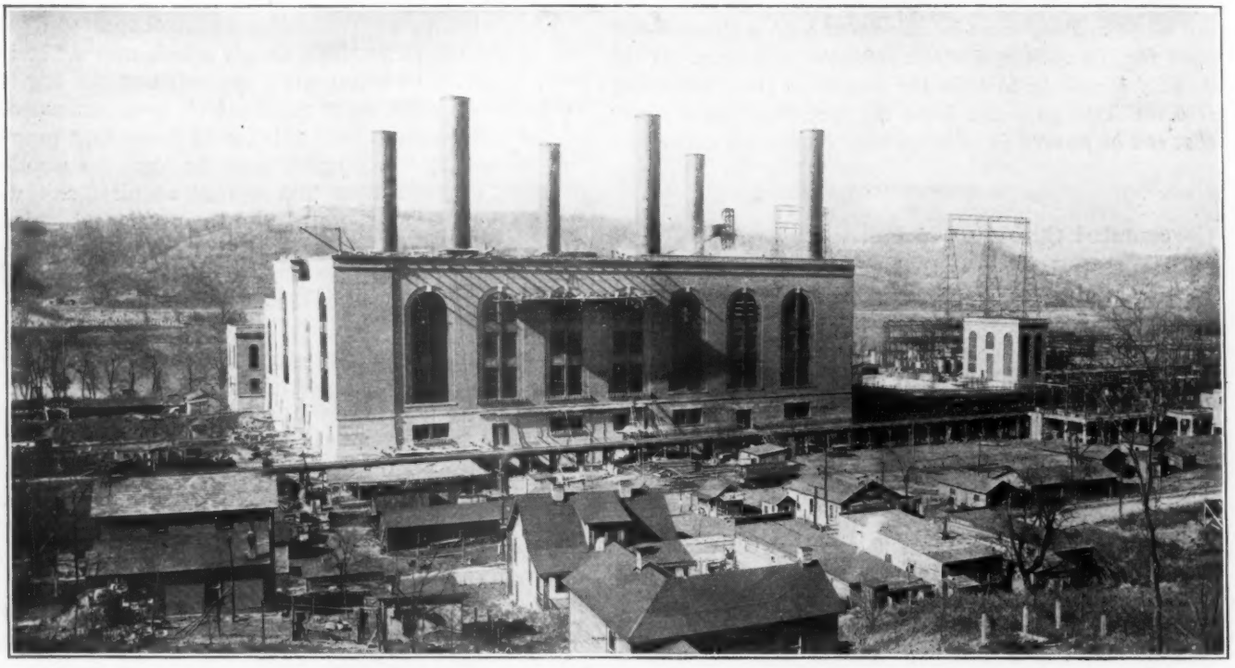
Any other course than this would mean that properties taken for one purpose may be kept for another purpose; it would mean that systems acquired as a war agency may be incorporated into the permanent government organization. If so radical a change in government function is to take place, it should be made only after careful appraisal of the real merits of the separate policies.

It was an experiment to have the government assume the direction of the properties in war time. We believe that experiment under war conditions could not fairly reveal the strength or weakness of government control sufficiently to justify a permanent decision on the basis of that test alone; but control extended over the post-war period as authorized by the law is at least a reasonable test of the efficiency of governmental direction. The government raised railroad rates during the war to a higher level than the railroad corporations would have been likely to dare to do, and it gave a quality of service that compared unfavorably with that given by the corporations before the war. These conditions, however, were in part the abnormal results of war. Now with the more orderly conditions of peace, the government should be able to test thoroughly the efficiency of its coördination of the properties, and this is true of those under the Postmaster-General as well as of those under the Director-General of Railroads. At the end of the periods provided by the laws for war-time control of these agencies it will be possible to form an intelligent estimate, based on fact, of what the government has done. If the government control has been wisely directed and if it has yielded benefits to the public greater than those received under private control, there ought to be no objection on the part of the authorities to a comparison that would support this claim.

Consider for a moment what privately operated business industries of the country did under the same war strain that the government confronted. Take the steel industry or the different branches of the electrical industry which were directly affected—electrical manufacturers, central stations or jobbers. Production was hampered by the enlistment and drafting of men for military service. But in spite of restrictive fetters on labor and materials the production curve ran sharply upward. The military necessities of the times called for the most strenuous efforts on the part of privately owned and operated industries, and these efforts were put forth with a vigor and intensity unsurpassed in history and with results which will go down into history only second to the sacrifice of our brave men. Our industries made a record in big production under private initiative which governmental bureaus will have hard work to duplicate.

Practice and Preach Conservation

By Leading Their Communities in Fuel Conservation in the Reconstruction Period and Afterward Central Stations May Sustain Interest in This Subject and Render a Public Service



THE WINDSOR STATION TRANSLATES INTO DEED THE MOST ADVANCED ENGINEERING PRACTICE OF THE INDUSTRY

REVIEWING the lessons of the war applicable to central stations, one fact stands out sharp and bold above others: The principle of mass production, the ideal of the industry for many years, has received a great public indorsement that might never have been given under normal conditions. National government officials, members of Congress, magazines and newspapers of general and other than electrical circulation, many individuals, have accepted the principle of concentration on which the strength of the industry rests. It remains for the executive officials and operators of the systems to hold and strengthen the place in public estimation that this experience has given.

Experiences during the war will accelerate the further development of the essential principle of mass production. When the output of one system reaches its maximum of efficiency there are new possibilities of economy to be realized if two or more systems are linked together. And the principle has another unique application when two companies join together for the purpose of building a generating station which shall be interconnected with both of their systems. The construction of the Windsor (W. Va.) plant of the American Gas & Electric Company and the West Penn Power Company as a joint enterprise to supplement the existing facilities of the two systems translates into deed the most advanced engineering practice, the best economic thought of the industry. It blazes the path to future progress.

Mass production, first a vision, then a fact, is now generally recognized as an element in the economic welfare of the country. It will serve still more effectively as an aid in selling service under the new conditions. It shows customers and prospective consumers what specialized production really means in economy and reliability. It has a new potency when laid as an argument before electric railways to induce centralization of power generation and distribution in the community. With added force it teaches the isolated plant owner the wastefulness of two stations when one can carry the load with plain economy of fuel and labor and other costs. The public service commissions learned quickly that the avoidance of plant duplication, the elimination of duplicate capital investment, was a factor in cheapening the cost of service. Now the basic principle of central-station service has world-wide acceptance. It should not be ignored in the wider application of electricity for trunk-line railroad operation.

Entering and ending the war with plants highly developed on this principle, the central-station industry cannot fail to benefit from the governmental indorsements of its economic position. It cannot be otherwise than encouraging to the men in the industry that the rank of their properties when the resources of the country were put to the searching test of war was so high. They are entitled to this encouragement as a tribute to achievement in the past, as a stimulus to project the underlying principle still further in future years.

The central station had continual contact with war agencies of the government. It was seen promptly by the Fuel Administration to be an economical consumer of fuel. This recognition, stimulated by the compelling

necessity of saving fuel, was expressed by representatives of the Fuel Administration in many ways throughout the country. The large problem of this essential war-making organization was how it could best overcome the appalling shortage of coal which the enforcement of the war program made inevitable.

The interest of the Fuel Administration was not in the central station as such or in the isolated plant as such; it was not in the pure economics of the situation; it was simply to effect fuel saving for the nation at war. The Fuel Administration is still concerned as a war-time agency in protecting the country against wasteful coal consumption. But there is no prospect in sight that its work will be long continued. It was able to stimulate interest in coal conservation because of the war needs and the patriotic compliance of citizens with the spirit of its regulations. When the factor of the war no longer exists, when there is no appealing or ruling body at Washington, the central stations can take up in part the work of keeping public interest alive and keen on the vital question of conservation of fuel resources. Even though there is selfish business advantage for them in so doing, they can meet the issue in a broader spirit than that of every-day commercialism. They can preach as well as practice conservation and make continual appeals for fuel economy an element in their service to the public.

For certainly the wasteful practices of fuel consumption in old days are intolerable; they are unjust to this generation and to those that will follow. They not only deplete the precious and irreplaceable fuel stored by nature, but they stimulate over-rapid production. Even though the stimulation of coal production in pre-war days tended to keep the price down, it reached the point where probably some coal was marketed at less than the fair cost level; and this kind of a condition leads in time to reaction. In any event the price of coal is a part of the cost of service which the central station will have to pass on to the public, but the conservation of coal is an issue which is inseparable from the future of the industry and the public welfare.

With its established basic principle, its recognized economy of operation, its steady striving for improvement in load factor, plus its fine war-time record, the central station can logically continue to show how its output can be used most economically in the service of the community. It is a work in which the different departments may coöperate to excellent advantage. It touches purchasing, plant operation, new business, advertising, public policy.

Meeting the Problems of the Reconstruction Era

HENRY I. HARRIMAN

IN MEETING the problems of the reconstruction era, a gradual diminution of federal control of industry in general should be brought about," said Henry I. Harriman, president of the New England Power Company and of the Boston Chamber of Commerce, to a representative of the ELECTRICAL WORLD. "Under peace conditions the necessity for governmental price fixing and for the control of output, material and the labor supply will grow less and less. The regulation of public utilities by state commissions along constructive lines should be continued in preference to any program for the federal regulation of rates, capitalization and service.

"As to the labor situation, it will be an advantage that the return of our victorious troops from foreign service will be gradual, thus tending to reduce the shock to the labor market which might result from a return *en masse*. While there may be some fall in the price of labor when peace is fully established, it is to be hoped that this will be commensurate with a corresponding reduction in the price of materials and the cost of living. Industrial development suspended by the war should go forward as soon as possible. The market for many products hitherto classed as non-essentials must be supplied. The extension of electric service into every commercially justified field should be encouraged to the limit.

"The time is now more than ever ripe for the passage of legislation by Congress which will permit the development of water power on the public lands and on navigable streams. The importance of such legislation as a real conservation measure is not easily exaggerated. Waste of power in economically justified developments is not in accord with the spirit of the new era and should not be allowed to continue. Capital should be encouraged to flow into electrical expansion work. Efficiency engineering and research should be given the utmost support; fuel economy should be continued and increased, and the interconnection of electric systems favored wherever commercial considerations warrant this policy.

"Foreign trade should be cultivated with energy; coöperation should be the slogan of the new era, and a broader conception of the engineer's opportunities for usefulness should be adopted. The engineer is needed in public affairs, and in the reconstruction work of the world which has already begun his services will be scarcely less important, if such a comparison can be made, than in the war."

Complete Electrification of Sugar Mills

Extensive Application of Motors in This Industry Is of Recent Origin—Very Satisfactory Results Obtained in New Cuban Mills, Showing the Possibilities That May Arise in This Field as It Is Developed

BY CLARENCE G. HADLEY
Superintendent and Chief Engineer Palma Sugar Company, Central Palma, Oriente, Cuba

AT THIS time, when the world is feeling the shortage of sugar and when the accelerated production of this commodity is necessary to the welfare of many peoples, it is fitting that the part electricity is playing and can play in the production of sugar should be appreciated.

In the sugar industry, as in most industries where steam-driven machinery has been applied for many years, progress in the use of electric drive is made only one step at a time. The first application of this modern form of energy about sugar mills was for the lighting of the mills and yards. After this a few motors were installed for minor services, where they proved so successful that it was decided to utilize them throughout the boiling department for the operation of the numerous pumps, thus doing away with the very serious losses from condensation in the long and complicated steam lines needed to operate the corresponding small steam engines. When this point was finally reached, even in the most modern mills and not by any means in all of the mills, the progress of electric drive was halted temporarily.

The steam-driven cane-grinding mill is a very satisfactory piece of equipment, and the older mills are inclined to stick to a well-tried friend. There has even been much doubt expressed by sugar men whether electric motors could be built for the service. However, in 1913 the Central Amistad sugar mill, at Guines, Cuba, was completely electrified by the Kelvin Engineering Company of Havana and New York. This was the first complete application of its kind, so far as the writer knows, in the world, and for that reason the electric motors were mounted on temporary bases alongside of the old steam engines. After one year's experience the engines were removed and the motors were installed in permanent locations. During 1915 the firm of Diebert, Bancroft & Ross of New Orleans constructed four sugar mills, all of the same size and design. This was the first attempt to reach standardization in this class of construction.

The original plans of the Palma Sugar Company were for the installation of steam engines for the mills and electric drive for all other parts of the house, but General Mario G. Menocal, President of Cuba and principal owner of the Palma Sugar Company, decided to have electric drive installed throughout. Accordingly what are known as the Florida and Palma mills were completely electrified. Both were rated at 1000 tons of cane per day, and both operated in a way to give the greatest satisfaction from the start.

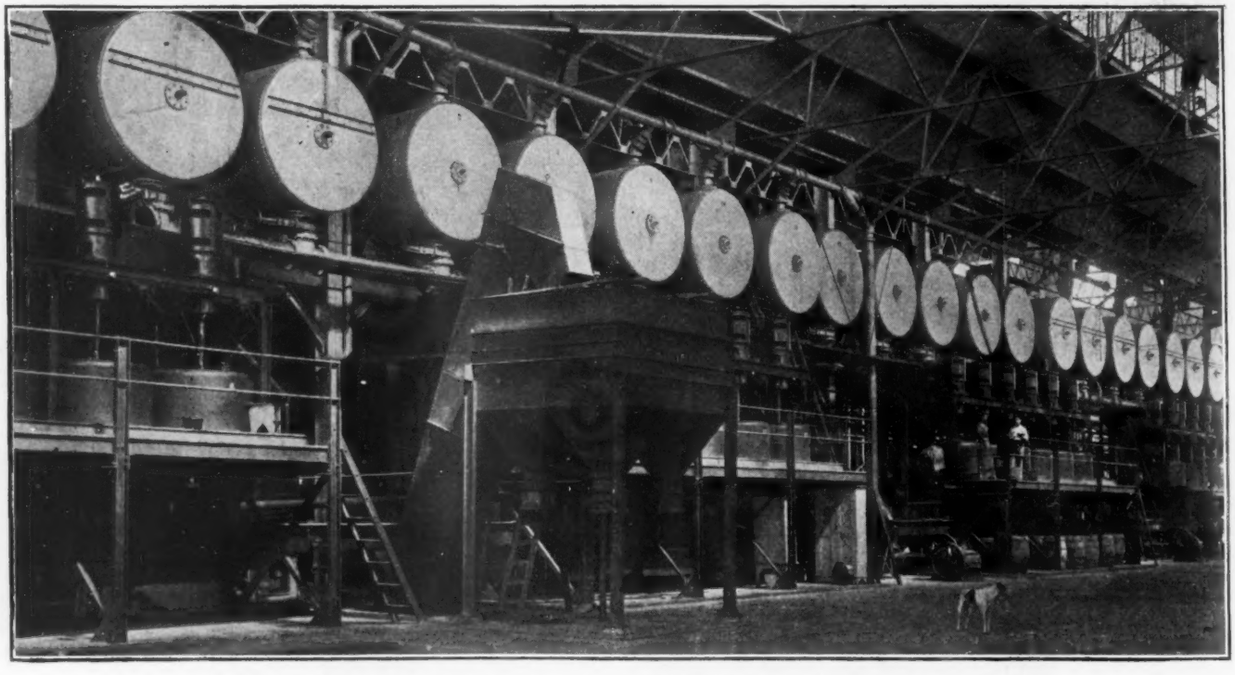


FIG. 1—VERTICAL-SHAFT MOTORS UNDER CRYSTALLIZERS DRIVE CENTRIFUGALS BELOW

At the end of the first crop it was decided to enlarge the Palma mill, increasing the capacity by 150 per cent. This was done, and a new mill was added of the capacity of the enlarged original The mill comprises grinding houses on one side and sugar warehouses on the other, the latter with a maximum capacity of 140,000 bags of

325 lb. (147 kg.) each. A brick building covered with stucco houses the electric generating plant.

Practically all sugar-mill electrification on the island is being made at 480 volts, 60 cycles, three-phase. This system is best adapted to the service, as the potential is not likely to be fatal in case of accidental contact, the conductors are not of excessive size, and the constant-speed characteristics of the squirrel-cage motors are well adapted to use with the numerous centrifugal pumps. The few variable-speed motors installed are of the slip-ring type, all controlled by electrical contactors and resistors, with master switches at the most convenient operating point.

The unit of the cane-grinding equipment is the single mill, consisting of two large horizontal rollers with a third roller riding on top and held down by hydraulic pressure maintained by accumulators so as to exert a

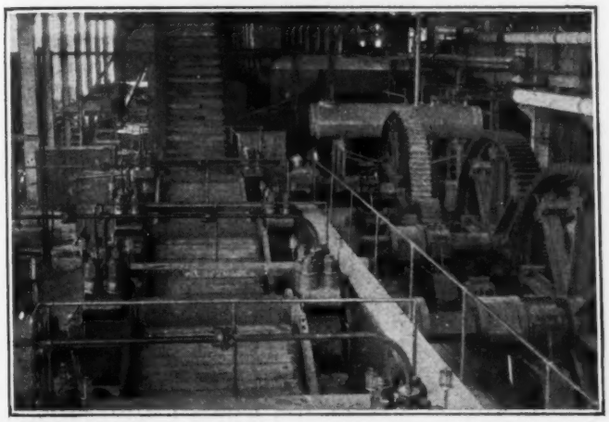


FIG. 2—CANE-GRINDING EQUIPMENT OPERATED BY VARIABLE-SPEED MOTORS

pressure of from 250 tons to 400 tons on the cane passing between the rolls. The required number of mills are assembled in tandem with slat conductors between them to conduct the cane from one set of rolls to the next. The surface speed of the rolls is about 25 ft. (7.6 m.) per minute, and the opening between the rolls varies from $\frac{3}{4}$ in. (19 mm.) to $\frac{1}{16}$ in. (1.6 mm.). The mat of bagasse when expanded is about 6 in. (15 cm.) thick.

In this plant two tandems are installed, each consisting of five three-roller mills and one two-roller crusher. The rolls are 34 in. (86 cm.) in diameter by 72 in. (182 cm.) long, and the crusher is 32 in. by 72 in. (81 cm. by 182 cm.). Each tandem is operated by three variable-speed motors rated at 250 hp. each. Master switches are installed on a platform overlooking the entire tandem so that one man operates the group and regulates the feeding of the cane to the crusher. The operator has in front of him three ammeters showing the load on each of the mill motors and is thus enabled to regulate the speeds of the various motors, holding each to approximately full load all the time. With steam-engine-operated mills this speed variation is accomplished by changing the governor, but as there is no indicating device it frequently happens that in the desire to crowd each mill and get the most sugar out of the bagasse the rolls become choked and refuse to take the feed. With electric drive this is avoided, for when a "choke" is incipient the meter reading begins to crawl up and the operator relieves the load by reducing the speed of the preceding mill or increasing that of the mill which is choking.

In addition to the speed control by resistance, provision has been made in the power plant to split the busbar into two parts by means of an oil switch so that when it is desired to operate slowly while waiting for the arrival of more cane the mills may be operated at reduced frequency and voltage by using one turbine for the mill supply and one for the sugar-house load. Under normal conditions, however, the sectionalizing switch is closed and the whole house operated at 60 cycles.

All main leads are carried overhead on insulators on the roof trusses, but from the points where taps are taken off for the various motors the wires are carried in metal conduit so that ample protection is provided for the men and the wires.

FUEL AND STEAM REQUIREMENTS

The steam plant consists of fourteen horizontal return tubular boilers rated at 225 boiler-hp., but frequently operated at 300 hp. or even 380 hp. as shown by steam-flow meters employed. Bagasse or ground cane is used as fuel in a special type of Dutch oven, and would be sufficient to supply all steam needed for grinding the cane and boiling the juice were it not for the increased economy realized when additional water is sprayed on the bagasse as it leaves all but the last mill. In Palma this maceration water is held at about 15 per cent of the weight of the cane so that this additional water must be evaporated. In consequence thereof it is necessary to burn fuel wood amounting, under continuous operation, to the extent of 2.4 per cent of the weight of the cane, and running higher for the whole crop owing to necessary shutdowns for cleaning, repairs or lack of cane.

Steam is supplied at 150 lb. (10.5 kg. per sq.cm.) pressure to the electric plant and at 80 lb. (5.5 kg.) pressure to the boiling house. The exhaust steam from the turbines is used at from 1 lb. to 5 lb. (70 gm. to 350 gm. per sq.cm.) pressure for the first heating of the juice to the boiling point and for evaporation to syrup, while live steam is used for the final evaporation to a grain in the evaporating pans.

The sugar-boiling house contains two quadruple effects for evaporating the juice to syrup and six evaporating pans for boiling the syrup to a grain. The vacuum system in use for this boiling is a combination of the central vacuum system and the individual system. Each body which operates under vacuum has an independent jet barometric condenser while the non-condensable gases are removed by two short-belt-drive Ingersoll-Rand vacuum pumps and two Westinghouse-LeBlanc dry vacuum pumps. Provision is made for respraying all or any part of the condensing water in case it should become necessary during the hottest weather.

In its final stage the sugar is separated from the molasses by twenty-four centrifugals having baskets operating at 850 r.p.m. and each driven by direct-connected vertical motors with high resistance rotors. These motors are connected to the line by quick-make-and-break oil switches combined with a band brake for stopping The entire centrifugal installation was furnished by Pott, Cassells & Williamson, Motherwell, Scotland.

The dried sugar is packed in the bags and loaded into

cars or piled twenty-five bags high by a Brown portable piler.

The accompanying table gives a list of the various motors used in the mill. The equipment of this mill has been obtained from a wide variety of manufacturers, and all of it is operating with entire satisfaction and gives promise of continuing to do so.

MOTORS EMPLOYED IN CUBAN SUGAR MILL

Type of Duty:	Motors Installed— Number	Total Hp.
Variable-speed mill and conveyor drive....	10	1565
Centrifugal pumps	28	919
Geared pumps and belt drives.....	34	215
Centrifugals	24	360
Total	96	3059

The Demand-Meter Situation

Critical Discussion of Demand Meters, Pointing Out the Advantages That Are Gained Through the Use of Well-Known Types of These Instruments and Remedies for Some of the Troubles Encountered in Their Practical Application

BY C. F. MATHES
Meter Foreman of the Trinidad (Col.) Electric Transmission, Railway & Gas Company

INSTRUMENT manufacturers have devoted considerable time to the perfection of demand meters and have accomplished admirable results, but there still remains the necessity of reducing the attention required, assuring long-sustained accuracy, making the instruments adaptable to various services and reducing the first cost. Obtaining these factors devolves partly upon the manufacturers and partly upon the users, because even with the best-made equipment satisfactory results cannot always be obtained unless the apparatus is properly applied, installed and maintained.

For this reason the writer will point out the classes of service to which several well-known types of demand meters are particularly suitable and then outline some troubles which have been experienced with each. In view of the fact that the advantages of each type are passed over rather briefly and more space is devoted to troubles, the writer wishes to warn readers against forming the impression that the demand meters on the market have nothing but disadvantages. Instead, it is hoped that the experiences which are related here may suggest improvements to manufacturers and help users perform their part in obtaining satisfactory operating results.

The advantage of an indicating meter, such as the Westinghouse type RO, lies in the fact that a combined watt-hour meter and demand meter are combined in one case and the demand-meter element requires no extra connections, contact device or paper charts. This instrument, moreover, is not so expensive as other types or combinations of instruments and is easily installed, owing to its compactness and to its not requiring extra conections. The maintenance of this instrument is negligible, as the indicating demand hand can be read and reset at the regular reading period. Owing to reasonable first cost and there being no extra maintenance features to speak of, this is an excellent meter for small installations where the revenue derived does not warrant the use of the more elaborate equipment suitable for larger installations.

IMPORTANCE OF TIME AT WHICH PEAK OCCURS

Considering installations of moderate or large size, however, a type RO or similar instrument will hardly answer the purpose of defining a consumer's demand charge. Such installations generally require knowledge of the time at which their peak load occurs and just how much of a peak is attained at that time. The writer has attempted to use an ordinary indicating type of demand meter on just such installations, with the result that at some time or other the consumer will complain about his high demand charges. In such cases the watt-hour-meter and demand-meter element would be checked for correctness. After this, what conclusive argument could be presented to the consumer? It could be said that the demand meter was correct, and evidently the high demand in question occurred at some time or other during the time elapsed between meter readings.

CURVE-DRAWING METERS AND THEIR CHARACTERISTICS

In such cases, where the consumer and central station desire to know the exact time as well as the amount of peak demand, the only recourse is to install a curve-drawing wattmeter or a curve-drawing demand meter, such as a General Electric type G-2. Now, unless the installation is large enough to warrant the expense of a curve-drawing wattmeter with the necessary instrument transformers as permanent equipment, it may not be desirable to use this type of instrument, as first cost is considerable, and owing to the necessity of changing charts, winding the clock, refilling the pen and frequently checking the accuracy of the element, the cost and maintenance of such an instrument may be too great to warrant its use on small installations. When a central-station company gets several of these instruments on its lines over a widely scattered territory, the general result is that it takes all of one man's time to look after them, as the nature of each load has to be studied to get the proper speed for the paper feed, and the instrument must be kept in proper time and otherwise maintained.

With the Westinghouse types of graphic wattmeters, having self-winding clocks, the writer has had considerable trouble in keeping the clocks going. The clocks do not seem to have strength enough to carry the proper re-roll attachments, and it has not been found advisable in most cases to attempt to use the re-roll attachment but to catch the used paper in a basket or other receptacle set under the instrument. Trouble has also arisen because of the failure of contacts to release after the cam has traveled past the point where

they should release. In such cases the motor will wind the spring to such a tension that the spring will break from its fastenings on the shaft.

SOLUTIONS OF DIFFICULTIES WITH G-2 METERS

Regarding the General Electric type G-2, the writer is glad to note the departure from the pen-and-ink system used on other instruments. The specially prepared chart, however, has given trouble in other respects. On certain outdoor substations it has been noted that in zero weather the stylus will not make a line on the chart, and then again on installations where the meter is liable to have the sun strike it the charts will turn purple all over. This makes it impossible to read any lines that may have been made by the stylus. In places where the meter is subjected to extremely low temperatures the writer has found it practicable to install several carbon lamps in the meter house to provide a little heat. A home-made thermostat installed to regulate the heat in the instrument itself has also been seen elsewhere. This heat in the instrument was provided by two 10-watt lamps mounted on a wooden block in the instrument case between the clock mechanism and the outer case. The latter scheme provided heat behind the chart, as it was found that one of the two lamps could be mounted almost behind the stylus and one slightly to the right of the terminal block in the lower part of the instrument, the burning of both lamps being regulated by the thermostat. On installations where it was possible for the sun to spoil charts it was found advisable to take an old chart and paste it on the inside of the glass cover of the instrument.

The disadvantages of this type of meter, other than those already outlined, are that the clock has to be wound and the chart changed once each week, a procedure which is almost identical with the maintenance features of the curve-drawing wattmeter types. For instruments installed at distant points from the meter department headquarters the writer endeavored to have switchboard attendants, electricians or others change charts and wind clocks on these meters, but succeeded in getting only fair results. It was found that charts would be left on from eight to ten days and the clocks allowed to run down; also, the charts would be put on carelessly and the stylus arm handled improperly, thereby throwing the instrument out of calibration. The stylus would be started from a point below zero, and in many cases the stylus would start at a time interval from the knurled nut that holds the chart in position. Conditions of this kind made it impossible to obtain a true demand on certain installations; so the writer found it safer, though more expensive, to have a company meterman take care of the instruments entirely.

On several meters it was found that the stylus arm would not return to zero at the end of one time interval and would continue on the second time interval on the same line. In some cases the stylus would go over the top of the chart and stick there until it was discovered on the next visit of the meterman. In other cases the double time interval would not reach the top of the chart and the stylus would be reset at the end of the second interval. In cases of this kind it was often hard to decide whether the line was a legitimate demand peak or a double interval. The cause for this double interval was found to be in the slide gearing arrangement. A little oil applied to the gear shaft and the working of the gear on the shaft has about eliminated this trouble. With the early types it was necessary to remove the entire face plate of the meter to get to the sliding gear and its shaft. In the later types a round hole has been provided in the face plate, so it is possible to inspect the gear and shaft without removing the face plate.

Trouble with the contact-making mechanism for these meters was also encountered. Cams were found upon which the brushes had worn round grooves in the sharp points of the compound cams, thereby allowing the brushes to make continuous contact when the condition of the cam became bad. In this matter the writer is now experimenting with a fiber cam, with good results so far. Regarding meters that had two-point and three-point cams it was found rather difficult to calibrate the meters on light load. This was partly due to the unequalized friction. To overcome this difficulty it was found practicable to take enough disk revolutions on the light-load check to allow the cam to make two complete revolutions. After taking several checks at light load in this manner, good accuracy could be attained. On the more recently purchased contact devices it was found advisable to have cams with ten or fifteen points to equalize the friction on light loads better.

It is interesting to note, from several experiments, that the type RO meter will invariably show a higher demand when installed on the same load as a type G-2. This is evidently due to the different principles upon which the two meters operate and the inability to keep them in step in regard to the time intervals.

The General Electric type M line of demand meters have similar drawbacks to the RO type, inasmuch as they are only suited to small installations where a demand indication is seldom or never questioned. Aside from this, they require a contact device installed on a regular watt-hour meter, extra wiring, and, unless the scale is calibrated for the particular installation, an odd constant is derived, which also holds true for the G-2 meter.

CRITICAL DISCUSSION OF THE TYPE RA METER

The Westinghouse type RA meter, only recently put on the market, has not received much comment as yet, and it is probable that a number of companies have not experimented with it. The combination of a watt-hour and a demand meter in the same case, similar to the RO type, is a good feature, although the pen, ink, paper and clock nuisance is still manifest. The extra work seems to be put on the watt-hour meter register in the shape of additional gearing and pen arm. It is another type of meter in which the writer believes trouble will arise on light-load calibration should the register accumulate any friction from dirt, and dirt is bound to get into the instrument because of the continual removal of the cover to wind the clock springs and for changing of charts. The location of meters is not always the cleanest place in the world, and the cover of the type RA meter, which is only sheet metal, does not fit very well. The tendency seems to be for the sides, top and bottom to bulge out, which leaves openings for dust to get in. The stiffer cover of the RO type seems far

superior to the sheet-metal cover of the RA type, which is presumably used to reduce weight. The clock, having a very high-grade watch type of escapement, would also be sensitive to this accumulating dust. It seems that the escapement should be protected by a covering of some kind.

The mechanical construction on the Esterline types of graphic meters seems to be an improvement in this respect. The entire clock mechanism is inclosed and is about as free from the accumulation of dust as it is practicable to make a clock mechanism for curve-drawing instruments. The clearance for the paper charts between the metal framework supporting the spools seems to be very small, and a very close adjustment of the paper is necessary in order to assure its proper travel. Should the paper become out of alignment only slightly, the chart will not travel. It is also an instrument that would hardly allow handling by other than company employees, as it is necessary to remove the cover each time the clock requires winding or charts are to be changed or any adjustments made. Should other than company employees work on the meters, it would not be possible to seal them, and unscrupulous persons would have the watt-hour meter adjustments, which really govern the action of the demand element, available for tampering.

POWER REQUIREMENTS FOR DRIVING LIME PLANTS

Small and Unsound Blocks of Marble Crushed, Burned and Hydrated by Means of Electricity in New England Plant

ELECTRICITY is being used extensively as a motive power in the plant of the Vermont Marble Company not only to carry on the ordinary work of such a plant, but in crushing, burning and hydrating small and unsound blocks or marble usually considered as waste. For this by-product work over 500 hp. in motors is used, 25,000 kw.-hr. to 30,000 kw.-hr. being consumed each month. The ratings of the motors required for different purposes are indicated in the accompanying tabulation. Twenty-seven of these motors, with a total horsepower of 462, are induction motors, and three motors, used on the crane, are direct-current series type, having a total rating of 55 hp. Except for the kiln and crusher motors, which are of the wound-secondary type, all of the induction motors are of the squirrel-cage type. Wound rotors are used in the two cases mentioned to afford sufficient starting torque for the crusher and to permit operating the kiln at any speed between one-third and full speed.

Owing to the fact that power must never be shut off for more than a few minutes because of the warping of the revolving kiln which might result, a reliable power supply had to be assured. This has been obtained from a central station over two 11,000-volt lines. One bank of three 200-kva. single-phase transformers can be connected to either of these lines to step down the voltage to 460 volts. If any one of the units should fail, the rating of the others is sufficient to carry the load in open delta.

The waste marble comes to the plant in various sizes. If the blocks are over 12 in. (30 cm.) in thickness, they are transported by slings hung from a crane to the jaw crushers. From these pieces smaller than 12 in. pass to a gyratory crusher, which reduces the marble to 2-in. (5-cm.) fragments or less. These pieces are then elevated and screened, the rejected material being run through rolls that reduce it to 0.5 in. (13 mm.) thickness or less. All of the material is then elevated and conveyed into storage and kiln bins. The foregoing operations involve 272 hp. in equipment. This can reduce 25 tons of stone per hour from blocks 150 cu.ft. (4.3 cu.m.) to stone 0.5 in. in thickness or less.

The crushed stone is fed automatically from the kiln bin into another bin by cradle feeder. The kiln is built after the familiar cement design and is belt-driven by a 30-hp. variable-speed motor geared to give ten speeds from 0.55 to 1.5 r.p.m.

TABLE I—CRUSHING DEPARTMENT

Machine	Motor, Hp.
Jaw crusher, 60 in. by 48 in.	150
Gyratory crusher, No. 6 McCully	50
No. 1 elevator	7.5
Screen	7.5
Rolls, 36 in. by 16 in. superior	35
No. 2 elevator	10
Conveyor	5
No. 3 elevator	7.5

TABLE II—KILN DEPARTMENT

Machine	Motor, Hp.
Coal crusher	10
Bin conveyor	5
Coal elevator	7.5
Producer conveyor	5
Producer drive	5
Kiln (rotary), 20 ft. by 8 ft.	30
Dust conveyor	5
Cooler	10
Lime elevator	10
Total	87.5

TABLE III—HYDRATING DEPARTMENT

Machine	Motor, Hp.
Hydrater	15
Raymond mill	5
Raymond mill	5
Separating fan	20
Separating fan	20
Bagging machine	15
Total	80

TABLE IV—MISCELLANEOUS MACHINES

Machine	Motor, Hp.
Air compressor	15
Pump in cooler pit	3
Pump in quarry pit	2
Barrel elevator	2
Total	22

For hydrating the lime the Kritzer process is used, which consists essentially of stirring the mixture of lime water through 75 ft. (22.9 m.) of 24-in. (61-cm.) piping. As the powder which issues from one end of the stirring tube may contain grit or other impurities, it is air-separated by means of Raymond mills, cyclones and canvas tubes. This material is packed in bags by a Bates bagging machine. This department has six motors and can produce 4 tons to 5 tons of hydrated lime per hour.

Besides the equipment described, the plant has a cooper shop with a capacity of 500 barrels per day. These are delivered into the kiln building automatically as needed by a barrel elevator and run.

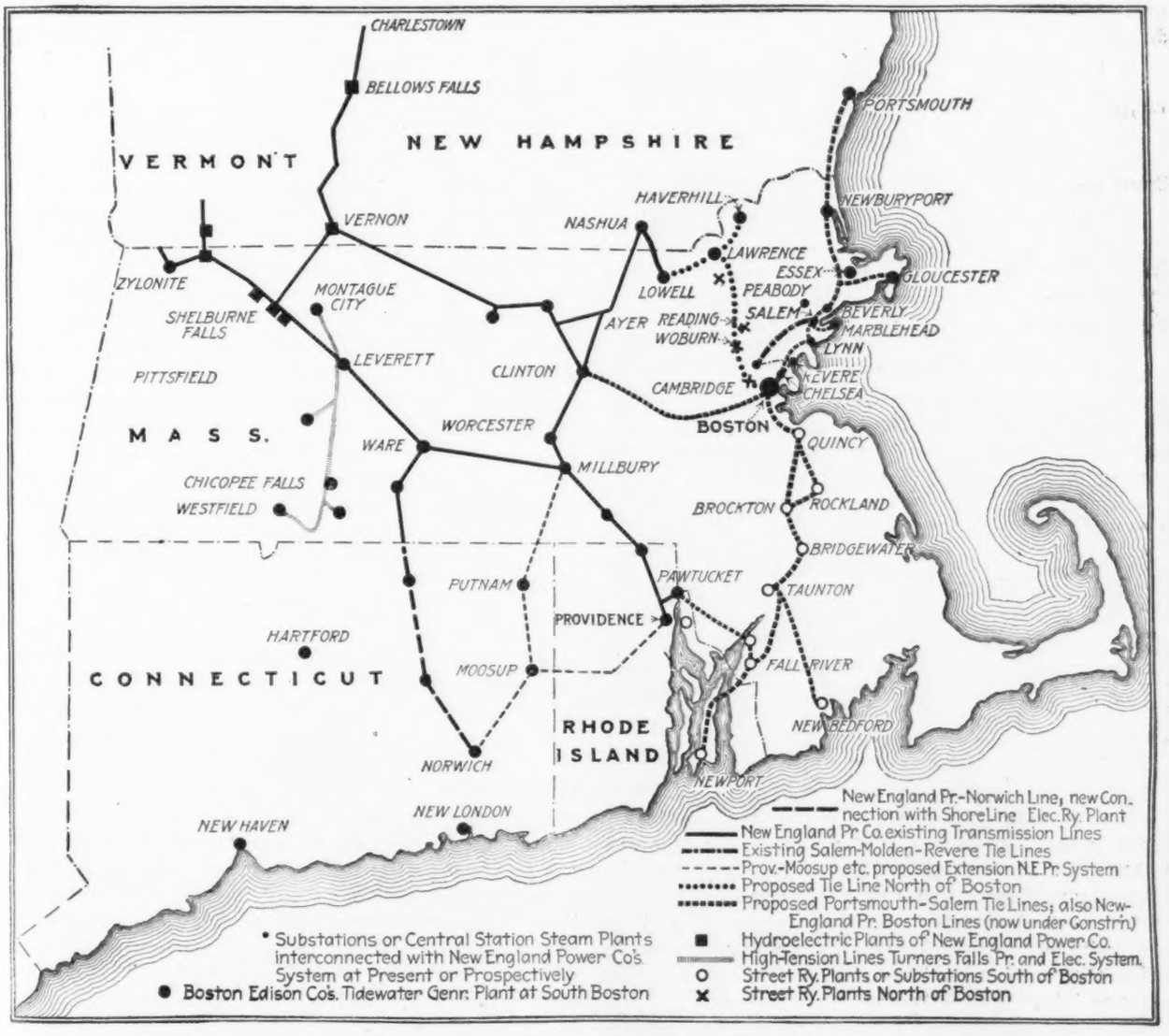
More Light on New England Interconnection

Estimated Savings to Be Exceeded—Convenient Energy-Exchange Arrangements—Water Power Oversold—Railroad Electrification Possible Without Buying New Generators—Price at Which Tie-Line Energy Can Be Sold

THE more the New England transmission system and central-station interconnection problem is studied, the better it looks from the standpoint of saving fuel and releasing plant capacity for the demands of an increasing power market. The latest determinations in this matter were given by L. L. Elden before the Boston Section of the American Institute of Electrical Enginers Nov. 5. Extended articles[1] on interconnection results and prospects in New England have been published in the ELECTRICAL WORLD, but a brief résumé is given below of the additional information now available, especially in relation to the economies anticipated by including various electric railway generating plants situated north of Boston in the general scheme.

The broad plan of interconnecting plants south of Boston is at present in abeyance, partly on account of the right-of-way situation and partly because of the immediate difficulties confronting those desiring to raise money under present conditions. Step by step, however, a good deal is being accomplished, as the accompanying map indicates. Thus, a transmission line is now under construction between the Boston Edison company's system and the New England Power Company's system at Clinton, Mass., and the latter company is shortly to be connected with the Shore Line Electric Railway Company's new steam plant near Norwich, Conn. Operating figures available since the publication of the foregoing articles on interconnection indicate that

[1]See issues for March 2, 1918; June 8, 1918; June 29, 1918; Aug. 10, 1918, and Aug. 17, 1918.



ELECTRICAL INTERCONNECTIONS WHICH ARE UNDER WAY OR HAVE BEEN MADE IN MASSACHUSETTS

the savings estimated on the 1916 basis will be exceeded when the interconnection is accomplished, in view of the increasing loads and outputs which are a feature of the electrical supply situation within the territory.

The expansion of the Boston Edison system during the last fifteen years furnishes an excellent instance of the benefits of interconnection. This company has taken over about forty plants in this period, the combined output of which ten years ago was about 100,000,000 kw.-hr. yearly. The average coal consumption was then about 4 lb. (1.8 kg.). The output is now about 300,000,000 kw.-hr. a year, and under the best operating conditions, with 2 lb. (900 gm.) of coal per kilowatt-hour there is being effected a yearly fuel saving of about 600,000,000 lb. (272,000,000 kg.). The fact that the numerous small plants have been shut down and that the system is supplied almost entirely from one or two tidewater stations does not invalidate the good results which have followed the interconnection of the central-station systems into a comprehensive single property.

PRODUCTION STATISTICS FOR PLANTS NORTH OF BOSTON, FOR YEAR ENDED JUNE 30, 1917

	Station Generating Capacity, Kw.	Maximum Load, Kw.-hr.	Kw.-Hr. Generated	Total Coal, Lb.	Lb. per Kw.-hr.
Bay State St. Ry. Co. (Chelsea)	3,950	3,700	12,412,000	34,753,600	2.8
Lynn Gas & Electric Co.	11,739	5,300	15,289,960	40,280,000	2.95
Bay State St. Ry. Co. (Lynn)	3,950	3,860	12,783,276	34,642,678	2.71
Total	19,639	12,860	40,485,236	109,676,278	2.709
Suburban Light & Power Co. (Revere)	1,400	2,000	2,387,300	833,056	3.5
Malden Elec. Lt. Co.	4,424	4,230	12,257,920	37,428,765	3.053
Salem Elec. Lt. Co.	13,437	8,800	22,333,990	41,673,600	2.09
Bay State St. Ry. Co. (Salem)	4,850	2,994	10,068,574	23,963,206	2.38
Peabody Municipal Plant	850	800	3,431,000	12,438,720	3.625
Marblehead Municipal Plant	600	400	1,046,415	6,783,920	6.49
Beverly Gas & Elec. Co.	1,875	1,240	3,141,605	10,928,000	3.896
Bay State St. Ry. Co. (Gloucester)	1,500	720	2,241,904	10,200,663	4.55
Gloucester Electric Co.	1,500	900	2,378,572	7,864,640	3.307
Total	30,436	22,084	59,287,280	152,114,570	2.56
Bay State St. Ry. Co. (Essex)	440	310	658,220	3,100,216	4.71
Ipswich Municipal Plant	380	300	500,478	3,012,800	6.02
Bay State St. Ry. Co. (Byfield)	500	384	758,009	3,994,136	3.95
Newburyport Gas & Electric Co.	3,525	2,200	3,568,282	11,917,040	3.34
Total	4,845	3,194	5,484,989	22,024,192	4.015
Cambridge Elec. Lt. Co.	14,412	7,000	21,240,567	50,617,280	2.383
Bay State St. Ry. Co. (Woburn)	3,750	3,140	10,302,882	24,726,917	2.4
Reading Municipal Plant	1,000	750	1,238,019	4,987,808	4.03
Lowell Elec. Lt. Co.	11,840	7,000	23,481,243	54,228,160	2.31
Bay State St. Ry. Co. (Lowell)	4,300	2,805	14,499,868	33,204,698	2.29
Lawrence Gas Light Co.	12,350	2,973	1,089,470	9,150,400	8.40
Bay State St. Ry. Co. (Lawrence)	3,365	2,706	8,743,657	21,334,523	2.44
Haverhill Electric Co.	4,937	3,750	9,599,020	29,536,954	3.077
Bay State St. Ry. Co. (Haverhill)	2,200	1,666	5,587,523	15,030,437	2.69
Total	58,154	31,790	95,782,249	242,817,177	2.535
Grand total	113,074	69,928	201,039,754	526,632,217	2.62
Spare capacity	43,146	Saving at 2 lb. kw.-hr.		124,644,647 55,645 tons	0.62
Value of equipment released (at $80 per kw)	$3,451,680	Saving at $8 a ton, $445,160 yearly			

Ten years ago, excluding electric railway and municipal plants, the total output of the central stations in Massachusetts was about 200,000,000 kw.-hr., and the average fuel consumption was 3.5 lb. This output has now risen to about 849,000,000 kw.-hr., of which 565,000,000 kw.-hr. is steam-generated with an average fuel consumption of 2.61 lb. (1.2 kg.) per kilowatt-hour. If all these plants were interconnected to-day and were economically operated, an average fuel consumption of about 2.25 lb. (1 kg.) could be realized, and this would mean an annual saving of about 140,000 tons of coal, representing $700,000 at $5 per ton, or $1,112,000 at $8.

In the district from Portsmouth, N. H., to New Haven, Conn., the generating capacity of the central stations is approximately 1,000,000 kw. The total load of these plants does not exceed 75 per cent of the combined ratings and in individual groups of stations probably does not exceed 60 per cent. Few of the plant groups which are or would be naturally associated from the electrical standpoint are over 50 miles (80 km.) apart, and the total distance from group end to group end is not much over 250 miles (400 km.), the maximum width of the groups being about 90 miles (145 km.) over all. Enormous advantages would result from the interconnection of the plants within this area beyond present benefits. To-day oversold water-power systems are drawing upon steam reserves in every direction. Little or no additional investment in generating equipment would be required to realize the benefits of interconnection in the area shown on the map. In the steam-driven central stations contracts with water-power companies now usually contain a provision that only non-peak service need be furnished to the hydroelectric companies. The recent contract executed between the Boston Edison and New England Power companies provides that only surplus energy need be furnished the latter by the former.

It appears doubtful if any very substantial water-power developments can be made in future in Massachusetts or Rhode Island on a basis which will materially reduce the need for steam-plant service on a large scale. The New England and Turners Falls companies have together developed about 80,000 kw. in hydroelectric generating capacity, and the total water-power developed in Massachusetts and Connecticut probably does not exceed 125,000 kw. Future developments by the water-power utilities are likely to include a very substantial increase in their steam-plant facilities. Thus, the Turners Falls company has recently placed in operation at Chicopee Junction, Mass., a steam plant which may be developed in future to a rating of 100,000 kw., now supplementing about 35,000 kw. in water power. The New England Power Company purchases probably 50 per cent more steam power than it generates in its hydroelectric plants. Its connection with the Boston Edison company will provide for the supply of about 15,000 kw. off-peak energy to the New England lines, and arrangements will be made so that by water cooling the transformers can be forced to deliver 20,000 kw.

It is of interest to note that studies of railroad electrification requirements between Boston and Providence indicate that the entire train service between the two cities could be supplied without the purchase of a single additional generator if interconnected central-station service were made available for this work. The load, based on early analyses, would probably be in the vicinity of 20,000 kw.

The accompanying table gives the estimated savings in fuel on the 1917 basis of outputs and consumptions which might be realized in twenty-five steam plants north of Boston through interconnection and centralized operation. By including railway plants previously omitted in these estimates it appears that interconnection from Newburyport south would release 43,146 kw., the total generating capacity of these stations being 113,074 kw. and the sum of the peak loads 69,928 kw. The 1917 output of these plants was 201,039,754 kw.-hr., and the average coal consumption was 2.62 lb. (1.2 kg.) per kilowatt-hour. The range of unit fuel consumptions in the individual plants was from 2.09 lb. to 8.4 lb. (950 gm. to 3.8 kg.) It appears that with operation on the interconnected basis there would be an annual saving of at least 124,644,647 lb. (57,000,000 kg.) of coal, representing at $8 per ton $445,160 per year. At the low figure of $80 per kilowatt of plant rating, the value of the generating facilities released by interconnection would be $3,451,680.

So far the central stations north of Boston have not shown any great interest in the interconnection problem, with the exception of the Salem, Malden and Revere companies, operated by C. H. Tenney & Company of Boston, whose tie line and its results have been described in the ELECTRICAL WORLD. On the south of Boston limitations connected with the Bay State Street Railway Company's right-of-way for its existing transmission line from the Quincy station to Fall River have held back development. The financial situation of the Bay State company, which is at present in the hands of a receiver, makes definite steps toward coöperation difficult. Continued study of the situation on the south of Boston indicates that there would be a diversity of peak loads of about 5000 kw. About 54,000,000 kw.-hr. would probably be transmitted yearly over the proposed tie line, and there would be an assured profit in the plan for all companies and plants sharing in it. With coal at $8 per ton an estimated tentative fair price at which energy could be sold to the coöperating plants off the tie line on the south of Boston is 1.1 cents per kilowatt-hour. This is based upon 2.25 mills miscellaneous costs, 7.14 mills fuel cost, and a profit to the transmission line of 1.5 mills. Some question has been raised regarding a possible reduction in efficiency of certain plants which would be shut down a part of the time, but the total price at which energy could be supplied off the tie line would be low enough more than to offset this slight increase in unit cost, if such an increase occurred in spite of skillful handling of the generating units and boilers of the stations associated with the program.

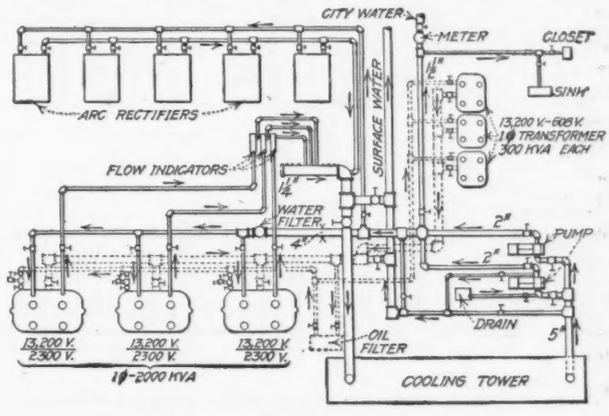
IN MOST of the countries of the world there will be a decided shortage of labor after the war. That country will best succeed which protects its workmen by improving their living conditions, guaranteeing a fair return for labor, protecting workmen and their families against accidents and idleness, and making workers better citizens. The country taking those measures will be the country that develops and makes products most economically. —*Edward N. Hurley.*

ARRANGEMENT FOR COOLING TRANSFORMERS IN SUBSTATION

Water from Cooling Tower Forced Through Units in Multiple and Circulation Checked by Flow Meters

An interesting arrangement for cooling 2000-kva., 13,200/2300-volt transformers is employed in a new substation built by the Worcester (Mass.) Electric Light Company. Normally the water is circulated through the transformer cooling coils on a closed system involving the use of a cooling tower erected in the substation yard. Make-up water is taken from the city mains. The circulation is maintained by the use of double-suction, single-stage, centrifugal Goulds pumps, direct-connected to 2-hp., 220-volt General Electric induction motors. This type of pump was selected as being more efficient than a single-suction pump. As one unit is continuously operated, even a small saving in energy at present prices of coal is deemed worth while.

The pumps draw water from the cooling tower and deliver it to a bus line terminating in a filter. Beyond



COOLING SYSTEM FOR TRANSFORMERS

the filter a branch pipe leads into each large transformer casing, and from the cooling coils of the latter the discharge water is carried through a riser to the operating room two floors above, where it passes through a flow indicator developed by the Spray Engineering Company. From the flow meters, which are mounted on a panel, the hot water is returned to a manifold, from which a connection leads back to the cooling tower. Metered make-up water is supplied to the system through a line connected into the transformer water supply main just beyond the pumps. The intake and outlet valves of each transformer of the water-cooled type are arranged so that any unit can be disconnected from the system without interfering with the others. Besides cooling the large transformers, this system of piping supplies water to the cooling coils of arc rectifiers also equipped with a Spray flow indicator.

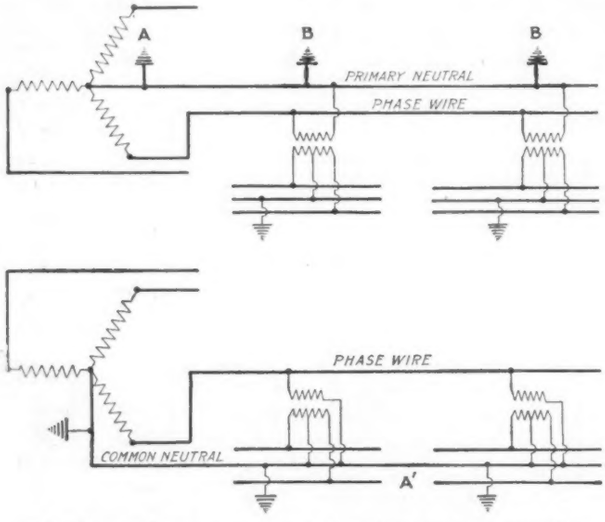
In general, the oil piping follows the same arrangement. All transformers are connected in parallel with the oil supply and discharge lines, and emergency drainage connections are included. A portable filter pump is used when it is necessary to change the oil. Either motor-driven water pump will handle the circulation required by the three main transformers and one spare unit of the same size. Space has been left in the pump room for the future extension of the pumping facilities.

Economical Increase Made in Distribution Capacity

Notable Saving of Copper and Transformers by Replacing Old Overloaded 2300-Volt System with 2300/4000-Volt Star-Connected, Three-Phase, Common-Neutral Primary and Interconnected Secondary

BY S. BINGHAM HOOD
Superintendent of Distribution Northern States Power Company, Minneapolis

THERE have just been completed in Minneapolis, Minn., extensive changes to a large section of the distribution system which serves the residential section in the south end of the city. The steady growth of this district had resulted in overloading the old system of mains and feeders to a point where good service was impossible. For some years past it had



FIGS. 1 AND 2—REGULAR AND COMMON NEUTRAL SYSTEMS

been found necessary to reinforce feeders, erect larger or more numerous transformers and increase the size of secondary bus lines. These changes were made as increased loads demanded, and, being purely local in their corrective character, did not result in a general betterment of the system as a whole.

Realizing that such methods of correcting local troubles were leading nowhere, it was decided about two years ago to entirely revamp this section of the system. The old system consisted of a network of single-phase, 2300-volt primary feeders and mains serving lighting and small single-phase motor loads. It included also several three-phase, 2300-volt feeders supplying the larger power loads, principally along a narrow strip following the railroad which bisects this section of the city. These feeders were supplied from a local step-down station fed from the 13,200-volt main feeder network.

The power feeders were unregulated, but each lighting feeder was equipped with an automatic induction regulator. Excessive drop from increased loads not only resulted in exceeding the safe carrying capacity of the feeders themselves but made the voltage variation too great for compensation by the regulators. The natural result of this was that these feeders quite generally operated unregulated during the peak hours because every regulator was "up against" its limit stops. To make matters worse, the variation in drop between different sections of the same feeder was excessive, and, finally, the drop on secondary bus lines made service to the customers near their extreme ends anything but first-class.

The selection of the ultimate system was made a matter of most careful and extensive study, resulting in the adoption of the 2300/4000-volt star-connected primary three-phase system, using a common neutral. The secondary bus lines were interconnected throughout each phase section in a manner very similar to standard direct-current network practice. This "common-neutral" system is not by any means so well known or its advantages so well understood as they should be. It has been successfully employed for a number of years in several large cities, and in every case has given most satisfactory results both as to economy and reliability.

TYPICAL EXAMPLE OF 2300/4000-VOLT FEEDER LAYOUT

In order to show just what this system is and to demonstrate its extreme simplicity, Fig. 1 is given to illustrate a typical single-phase branch from a 2300/4000-volt feeder. Here are two short secondary bus lines, each supplied from its own transformer. The primary neutral is usually only grounded at point *A* in or near the substation. Each secondary neutral must also be grounded to comply with existing regulations. This method of operation has frequently resulted in serious trouble due to excessive currents during single-phase short circuits flowing over the primary neutral. Where this condition occurs the drop in pressure in this wire raises the potential to earth. In many cases this increase is sufficient to cause not only excessive voltage

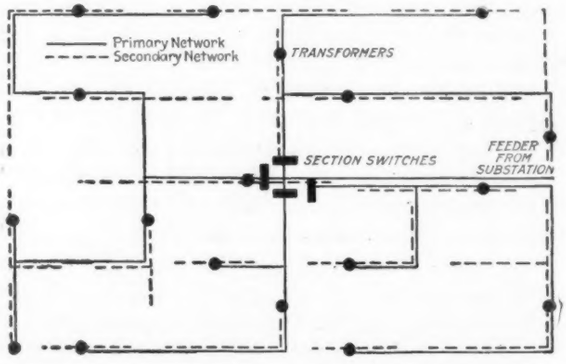


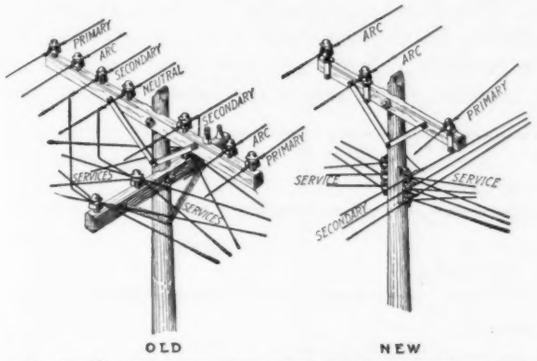
FIG. 3—ORIGINAL PRIMARY AND SECONDARY NETWORKS

on the other two phases of the same three-phase feeder but also breakdowns in insulation.

In order to overcome such undesirable conditions it is quite generally the practice to place additional grounds at other points on this primary neutral, as indicated at *B*. This permits the earth to carry current in par-

allel with the regular metallic return. Under normal conditions the division of current over the two paths is such that no detrimental effects result. In the case of short circuits, however, the earth will carry considerable current and the increase in potential due to distortion of the neutral is averted. Under some conditions this method of operation has been found to affect seriously local communication circuits where close parallelism occurs. With the "common-neutral" system such interference has been found to be of very rare occurrence and to be practically negligible.

Referring again to Fig. 1, it is clear that two wires of the system, the primary neutral and the secondary



FIGS. 4 AND 5—OLD AND NEW SERVICE CONNECTIONS ON POLE

neutral, are paralleling each other. Both of these are grounded and are presumably held at the same potential, and with a well-designed system each carries very small currents normally. It therefore follows that if these can be safely combined into one wire, considerable economy will be effected. The secondary neutral, if it complies with established requirements, must be "permanently and effectively" grounded. This means that the secondary ground must protect against high-tension crosses under the most extreme abnormal operation conditions. If it will do this, it most evidently will also protect against any normal operating condition; therefore these two conductors can be safely combined if the neutral grounds are what they should be. In order to obtain an effective ground, "water-pipe" grounds must be used or a considerable number of driven-pipe or rod grounds connected in parallel.

GETTING AWAY FROM TRANSFORMERS WITH TAPS FOR ODD RATIOS

Referring to Fig. 2, it will be noted that the secondary neutrals have been interconnected at *A'*, placing all secondary grounds in parallel. This secondary neutral is extended back to the substation and connected to the neutral of the primary bank, which is grounded at the station also. In connecting the line transformers the primary lead to the phase wire is protected by a fuse, choke coil and compression-chamber lightning arrester. The other primary lead is carried around the case and connected solid to the secondary neutral lead. This is, briefly, what is termed the "common-neutral" system. With it only one-half the transformer auxiliary equipment is required, compared with a delta system or even a star system with the neutral grounded at the substation only.

A further advantage as regards transformers is the ability to use a standard twenty-to-one ratio transformer for ratios of nineteen to one, twenty to one and twenty-one to one without recourse to taps. These odd ratios are obtained by tapping the grounded primary lead of the transformer to either one or the other of the outer secondary leads, thereby converting a standard transformer into an auto-transformer. This scheme is often of value in serving a scattered territory from a single long feeder.

NOT A THREE-PHASE PROBLEM

In order to get a proper conception of this system it should not be considered as a three-phase problem, but as a straight single-phase proposition using a single potential-phase wire and a grounded return of negligible resistance. In starting this work of changing over the system, conditions were generally as illustrated in Figs. 3 and 4, where the former represents the primary arrangement and the latter the short sections of secondary bus served. The first step taken was to interconnect all the secondary neutrals in order to form a neutral gridiron throughout the entire district served. The gaps between sections varied from several spans to that represented by the gap across insulating breaker knobs inserted between adjacent bus sections. These small secondary sections were mostly composed of three No. 6 B. & S. wires attached to cross-arms on which both series arc and primary wires were carried. Service taps were taken off from buck arms. The transformers varied in size from 5 kva. to 25 kva. and were mounted at the tops of the poles, being hung from the regular line arm.

In revamping this system of secondary mains with a view to later interconnection, a standard size of transformer (20 kva.) was selected. These units were generally installed on the cross-town streets at intervals

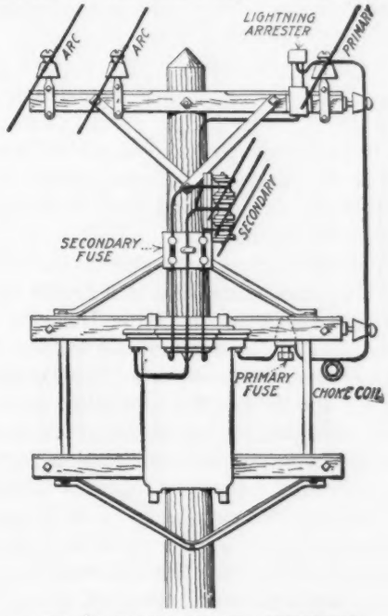


FIG. 6—TRANSFORMER MOUNTING

of three blocks, every second street being used for a cross-town main bus lead. On these cross streets a distributing bus was run, using No. 2 B. & S. for outers and No. 4 B. & S. for the neutral. Branch mains were then carried down intersecting alleys to complete the secondary grid. Where the load permitted existing

mains were allowed to remain up, otherwise the outers were replaced with No. 4 B. & S., the neutral being left No. 6. In re-running these mains secondary racks were used in all cases. They were located 2 ft. (0.6 m.) below the lowest high-tension line arm. Services taken off from the same side as the line rack were attached directly to this rack. Those on the opposite side were supported by a service rack of the same type as the other. Fig. 5 gives some idea of the improved appearance of the rearrangement.

The various neutrals were run through solid between sections, the outers being sectionalized by inserting a standard porcelain breaker knob. When the final change-over was completed these outer breaks were bridged by a jumper type of fuse block using a multiple copper-link fuse designed especially for this system. Each section of the secondary was so laid out that with these breaks open the load would be correctly apportioned to the transformer serving the section.

Standard Transformer Mounting Reduces Pole Stresses

In rearranging the transformers they were mounted on a new type of "standard" framing located so that the transformer would be 4 ft. (1.2 m.) below the lowest line arm, the secondary line rack being placed midway in this pole space. Fig. 6 shows this framing and indicates its advantages as regards accessibility and decreased pole stresses in comparison with the old pole-top mounting. Each transformer was fused temporarily on both sides of the primary, one leg being removed upon completion of the change-over, as is explained later. The secondary fuse, shown just above the transformer, is a special outdoor type of black using the copper-link multiple fuse on outer wires. The neutral goes through solid and is held rigid by a clip.

The rearranged secondary would appear as shown in Fig. 7. This arrangement was employed over the entire district, in so far as practicable. In interconnecting, the fuses were of course left off those breaks which formed the division between primary sections served by different feeders and from different phases of the three-phase station bus.

The old primary scheme as shown in Fig. 3 was that of running out a pair of No. 4/0 feeder wires from the substation to a load center. From this center branch mains were taken off through disconnecting blocks or oil switches to the several sections of the district served. In rearranging the district the territory was so divided that, roughly speaking, there would be three new sections for two old ones. Each new section required one No. 4/0 wire (ground return). This plan required running one additional wire parallel to an existing two-wire feeder. Ultimately the nearest paralleling feeder was removed. This meant using three out of four No. 4/0 wires between the station and the load, or a net saving on feeders of 25 per cent. In addition to this saving, the feeder capacity was automatically increased on account of increased voltage by 50 per cent, and, assuming negligible return drop, the losses were reduced by 66 per cent under present loading and by 50 per cent when the ultimate increase of 50 per cent is made in loading.

To complete the return circuit, heavy neutrals were taken out of the substation and carried in four directions for several thousand feet, tapping the secondary gridironed neutral network at each intersection. With this arrangement the return copper cross-section was very large, and no dependence was placed on the carrying capacity of the earth returns. It should be mentioned here that water-pipe grounds were liberally distributed over this entire neutral network, in addition to a large number of older driven-pipe ground connections.

From the end of the No. 4/0 feeder wire of each single-phase section smaller single-wire primary mains were run. These were connected in a series of closed rings. This closed-ring feature is essential to successful operation of an interconnected secondary network, otherwise a break in primary will permit of a step-up-and-down transformation around the break. Such a condition, if permitted, forms the trap which has resulted in failure of so many interconnection schemes. The new primary arrangement is typically illustrated in Fig. 7. Comparing this with the old arrangement of Fig. 3 will show at once the gain in simplicity and uniformity in voltage distribution which must result.

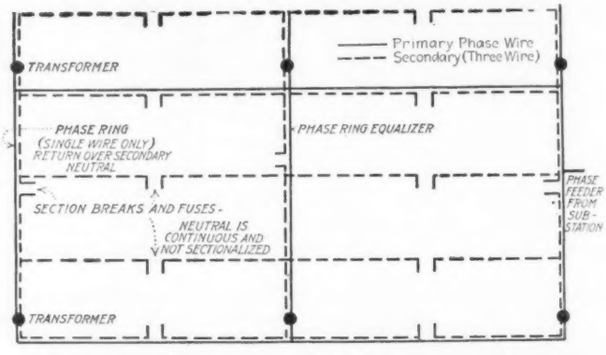


FIG. 7—NEW PRIMARY-PHASE SECTION AND SECONDARY NETWORK

Distinguishing Marks for Different Classes of Lines

In running these new primary lines, the old work, in so far as it was utilized, was overhauled, slack was pulled up, and the insulators were changed from glass to porcelain. A small 6600-volt porcelain insulator now is used to distinguish 2300/4000-volt primary wires from arc circuits. Secondaries, being on racks, possess a distinguishing mark for the low-voltage group. The old second primary was allowed to remain up until the time of change-over. It was reconnected where necessary to maintain the old circuit limits. Shortly before the change-over was made the old delta system was grounded and connected to the neutral network, this ground connection being attached to the *B* or middle busbar in the station. Following this, those single-phase circuits which were supplied from the *A-B* and *B-C* busbars were converted to common neutral return. In this conversion the old second primary was taken down, and the fuses, choke coils and compression chamber arresters were removed from the grounded side of the transformers. The driven-pipe grounds formerly used only for the arresters were at this time tapped also to the common neutral. As the change-over was made the various secondary sections were tested out for polarity

and were interconnected through the jumper blocks and fuses between sections.

On the final change-over the station transformers were changed from delta to star. At the same time the distribution network still supplied from the *A-C* pair of busbars was cut loose, one end of these sections being then tapped to the new feed supplied from the *B* bus, the other being grounded to the common return. Later these middle sections were cut over at each transformer and the surplus wire was removed exactly as had previously been done with the *A* and *C* sections.

STATEMENT OF RESULTS AND SAVINGS EFFECTED

It will be clear from the foregoing that the saving effected on the primary mains as well as the line transformer auxiliary equipment was just 50 per cent. In addition, there was a saving due to simplification of the distribution layouf, as can readily be seen from comparison of Figs. 3 and 7.

In converting the three-phase power circuits from delta to star considerable saving was effected by feeding small outlying power loads from overlaps from adjacent lighting feeders which were fed from different bus phases. This very considerably reduced the number of long but small three-phase primary branches in the system.

Where the power load was fairly well concentrated it was found economical to do considerable grouping. Most of the smaller power banks were operated open-delta, requiring either open-star operation or the installation of a third unit. By grouping these units advantage was taken of a wide diversity factor. In one case eighteen transformers, aggregating over 200 kva. in rating, were replaced by a single bank of three 30-kva. units. On the final change-over all that was necessary was to cut these remaining banks from delta to star on the primary side. In several cases customers were using the 2300-volt energy directly in their motors. For these auto transformers were installed, converting from 4000 volts to 2300 volts.

In this change-over the saving in transformers has been a very considerable economy. The total kilovolt-ampere capacity installed not only is less but those units released have been of the smaller sizes, having a greater value per kilovolt-ampere. These small sizes released will serve to fill demands for some time to come in those suburban sections where small units are needed.

SUPPLYING FLUCTUATING LOADS

A further economical feature of the interconnected secondary network worthy of note is its ability to supply fluctuating loads. With the old system of isolated secondary sections it was generally necessary to install individual transformers for rectifiers, X-ray outfits, single-phase motors, motion-picture machines and similar apparatus. All this equipment is now supplied from the regular secondary bus without noticeable interference with good lighting regulation.

The operation of this system is more than fulfilling all expectations. It has already successfully weathered several unusually severe lighting storms, these same storms having caused no end of trouble on the older system immediately adjacent to the district now served by the "common-neutral" system.

HIGHER COSTS PUSH UP EXPENSE OF PRODUCTION

Generating Costs Reflect Increased Fuel Prices and Emphasize Justice of Coal-Clause Principle in Contracts with Customers

Access to the cost sheets of four Massachusetts central stations handling peak loads of from 6650 kw. to 17,000 kw. during the last two years shows that the increased price of coal has had a striking effect upon operating expenses. A comparison of the station costs of these companies for two twelve-month periods terminating in 1917 and 1918 shows that, although the output at the switchboard of each company increased in some cases more than 40 per cent, the cost of coal was so much greater in each case that the cost of production per kilowatt-hour rose substantially, the larger part of the increase in unit expense being due to the fuel factor.

In 1917 the four companies each turned out from about 27,000,000 kw.-hr. to 40,500,000 kw.-hr., and their net production costs at the switchboard ranged from 6.78 mills per kilowatt-hour to 9.2 mills. The price of coal ranged from $4.935 to $5.73 per ton. Two of the plants are tidewater and two interior stations. In 1918 the outputs ranged from about 30,000,000 kw.-hr. to 51,000,000 kw.-hr., the prices of coal ranged from $6.47 to $8.28 per ton, and the net production cost per kilowatt-hour ranged from 8.95 mills to 12.75 mills. Three of the plants actually used less coal per kilowatt-hour in 1918. The labor costs at the stations examined did not show much change with one exception. The accompanying table of unit cost data is significant.

EFFECT OF INCREASED COAL COSTS UPON PRODUCTION EXPENSES

Plant designation:	A	B	C	D
Kw.-hr. generated, 1917....	$27,059,110	$21,872,900	$22,333,990	$40,507,750
Kw.-hr. generated, 1918....	30,286,260	31,529,200	33,103,670	50,896,500
Price of coal per ton, 1917...	$4.935	$5.07	$5.12	$5.73
Price of coal per ton, 1918..	$6.827	$7.76	$8.28	$6.47
Lb. coal per kw.-hr., 1917..	2.22	2.36	2.1	2.64
Lb. coal per kw.-hr., 1918..	2.10	2.31	1.93	3.1
	Cents	Cents	Cents	Cents
Coal cost per kw.-hr., 1917..	0.49	0.532	0.478	0.675
Coal cost per kw.-hr.,1918..	0.65	0.80	0.71	1.03
Labor cost per kw.-hr., 1917.	0.141	0.115	0.111	0.095
Labor cost per kw.-hr., 1918.	0.16	0.299	0.096	1.008
Total cost of manufacture per kw.-hr, 1917.....	0.75	0.745	0.678	0.92
Total cost of manufacture per kw.-hr., 1918.....	0.895	0.98	0.896	1.275

The load factors of the plants ranged from 29 to 37.5 per cent in 1917 and from 33.3 to 38.5 per cent in 1918. The plants responded well to the increased loads, but the increases in the price of coal were in general so great that even the most careful operation of the stations could not keep down the production cost as was desirable. The justice of the coal clause principle is vindicated by such results.

A thorough study of the cost sheets of these plants indicates that a plant of 10,000 kw. to 20,000 kw. rating is doing excellent work to-day in relation to its local opportunities if, with coal at an average of about $7 per ton, it turns out say 30,000,000 kw.-hr. a year at a net production cost of 9 mills at its switchboard, 6.5 to 7 mills of which is fuel expense and 1.5 mills or 1 mill of which is labor. As coal advances above $7 it is remarkably good practice to deliver energy at the busbars in medium-capacity steam turbine plants at 1 cent or under per kilowatt-hour.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

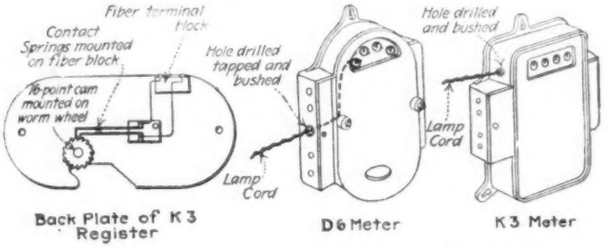
DEMAND-METER CONTACTS RENEWED IN REPAIR SHOPS

Considerable Money Saved by Not Sending Meters Back to the Manufacturers for Repairs but Making Them at Home

BY JOSEPH N. M'CLURG

Foreman Meter Department, Scranton (Pa.) Electric Company

By purchasing demand-meter contacts complete and mounting them in the repair shop, a central station has found that considerable economy can be effected. The manufacturer charges $1.50 for bushing meters and $2.98 for equipping the register with contacts. Contacts can be bought complete ready to mount for $1.98, including cam on worm-wheel shaft, adding 10 cents for ¼-in. (3-mm.) socket bushing and 3 ft. (0.9 m.) of lamp cord. It costs 90 cents to mount contacts on the



CONTACTOR ATTACHMENT FOR WATT-HOUR METERS

register, drill, tap and bush the meter case and to test the meter after contacts are mounted on register. This makes a cost of $2.98 and saves $1.50 for each meter.

One of the problems of doing this work in the shop is to determine the value of one contact for the register. This is accomplished by finding the value of one revolution of the disk of the meter in watt-hours and then the relation between the revolutions of the disk and the revolutions of the worm wheel.

Rigidly attached to the same shaft as the worm wheel is a fiber cam or ratchet wheel. Two small brushes of phosphor bronze are arranged so that they rise and fall as they pass over the teeth of the wheel, thereby opening and closing an electric circuit. If the number of watt-hours recorded per revolution of the worm wheel is known, it is simple to determine the value of each contact. The worm wheel has 100 teeth, and one revolution of the worm on the shaft of the rotating element causes it to pass over one tooth; therefore it must take 100 revolutions of the worm to pass over 100 teeth or to cause the worm wheel to make one complete revolution. Then if 100 revolutions of disk equal 2.4 watt-hours (meter constant), one revolution of the worm wheel will equal 240 watt-hours. The cam being rigidly attached to the same shaft as the worm wheel must also have the same value per revolution; that is, 240 watt-hours. The cam used on this meter has twenty points; there being twenty points on the cam, it makes twenty contacts. Twenty contacts will thus equal 240 watt-hours, or one contact will equal 12 watt-hours.

This method of calibration can be reduced to a formula: Let M = value of one contact in kilowatt-hours; A = number of points on cam; B = revolutions of disk to one revolution of worm wheel; K_h = constant marked on disk (watt-hours); C = 1000 (number of watts in one kilowatt); then $M = (K_h \times B) \div (A \times C)$ $M = (2.4 \times 100) \div (20 \times 100) = 0.12$ kw.hr. per contact.

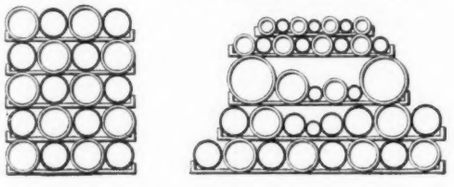
The contacts come in several different types for the different types of General Electric meters. They are I-14, D-6, DS-6, ID-3, IS-2, IS-3, DS-2, DS-4 and DS-5. The contacts for K-3 meters are different, and in buying them it is best to buy the worm wheel for K-3 register with the cam wheel mounted on shaft. It is advisable when using demand indicator on 440 volts to use a General Electric type V transformer for 440 = 110 volts. These are small size and built for use with the demand indicators.

SAFE METHODS OF PILING CONDUIT IN STOREROOM

Economy in Floor Space and a Minimum of Accidents Are Insured by the Use of the Plan Outlined Here

BY MATTHEW KING

In electrical storerooms stocks of electric conduit are generally kept in racks installed for this purpose, but when taken out to the job they are usually piled up in bundles in a pyramid form on the floor near where they are to be used. The amount that can thus be piled is limited by the width of the base of the pyramid formed. With any considerable quantity this must be made so wide that it is frequently in the way and as a result may be struck by passing hand trucks, etc., and



STRAP IRONS HOLD CONDUIT IN PLACE

the pile undermined. Severe accidents have been known to occur from this cause.

The accompanying illustration shows how a rectangular pile may be built of any width or height that obviates the danger of the pyramid pile and is of especial advantage where floor space is limited. Each layer of pipe is formed by two pieces of strap iron of convenient length and dimensions, each turned up at the end and placed as shown. Pipes of different diameters may be

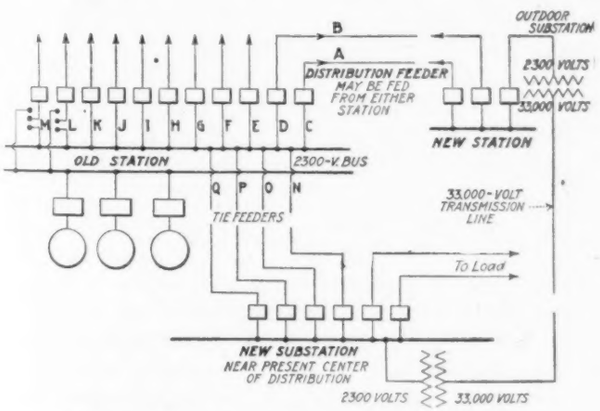
piled in one layer provided that the larger diameters are placed on the outsides. A pile of any width up to the limit of the straps may be built by simply changing the angle of the straps with respect to the pipe.

DISTRIBUTION CIRCUITS UTILIZED AS TIE LINES

Considerable Copper Saved in Laying Out New Central-Station System Necessary When New Power Plant Was Built for Central Station

Sometimes when a town or city is growing rapidly it so happens that the center of population is shifted in a certain direction. This shifts the center of the central-station load and often causes inconvenience and necessitates redesign of the feeder and distribution circuits. About thirty years ago, when the plant of the Binghamton (N. Y.) Light, Heat & Power Company was built, it was placed in the ideal condition near the river and a short distance from the business section of the town. It so happened, however, that with the development of the Endicott-Johnson Shoe Company to the west of the town many of the employees centered about this big industry. When the company decided to construct a new power house to take the place of the old one, it was built to the west of Johnson City.

In order to have capacity as soon as possible, the 2300-volt and 33,000-volt tie lines were built to transmit the energy developed by the 3500-kw. turbines immediately installed in the new plant. In the accompanying illustration an approximate outline shows how the system was redesigned. A substation was erected near the present center of load to be connected to both the old and the new plant. On account of the difficulty in getting material and the high cost of material and labor at the time of construction, plans were abandoned for building a permanent substation until a later date. The temporary substation, which is a corrugated building 16 ft. by 22 ft. (4.8 m. by 6.7 m.), contains the 33,000/2300-volt transformer as shown above.



PLANTS UTILIZING DISTRIBUTION CIRCUIT AS TIE LINE

Originally three generators at the old station supplied twelve distribution circuits radiating from this station. By extending two of these circuits, marked *A* and *B*, to the new station, the two plants were tied together on the 2300-volt buses. Energy coming from the 2300-volt bus at the new plant was stepped up by means of transformers to 33,000 volts, run through a 33,000-volt transmission line, and stepped down to 2300 volts again at the new substation. Two distribution circuits run directly from the 2300-volt buses at this substation.

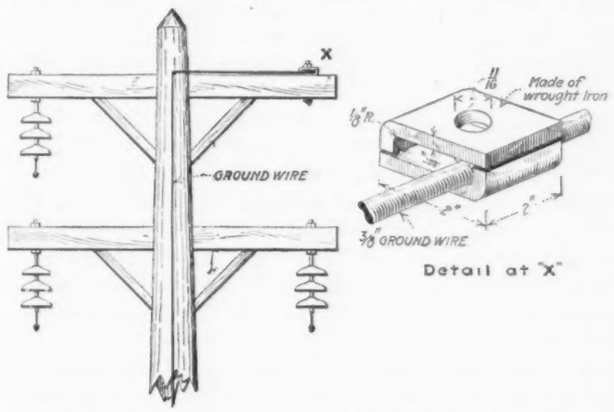
Radiating from the old station there were four distributing feeders marked *K*, *L*, *M* and *N* which happened to pass close by the new substation. The services fed by these circuits are now supplied by *O* and *T* from the substation, so the distribution circuits are no longer needed. These circuits were utilized by a little extra wiring as tie feeders between the old plant and the new substation. These feeders at present carry about 1500 kva. from the new plant to the old plant, but can also be used in feeding back from the old plant to the new plant in case of an emergency.

The two distribution feeders *A* and *B* can be fed from either the old plant or the new plant. A simple signaling device has been evolved which indicates which station is serving these feeders. In this way it eliminates any possibility of the two stations being tied together without being synchronized. All the circuits are connected separately at the old station, and therefore interconnection of the two stations is not considered necessary. The circuits can be rearranged to take care of the surplus of load at either station and provide for operating the machine a minimum number of hours.

SIMPLE SKY WIRE CLAMP FOR HIGH-TENSION LINES

Device Used to Bolt Ground Wire to Upper Cross-Arm Affords a Simple and Inexpensive Arrangement

A simple type of wrought-iron wire clamp is an interesting feature of the 66,000-volt transmission line recently completed by the Kansas Gas & Electric Company of Wichita, Kan. This clamp consists of two pieces of wrought iron arranged with bolt holes and curved edges so that the ⅜-in. (9-mm.) ground wires can be clamped between them by a bolt which runs through both sections of the clamp and through the cross-arm on a two-arm lead. The clamp itself is 2 in. (5 cm.) square and 0.25 in. (6 mm.) thick. It is considered especially well adapted for a line on which there are a number of turns or on a line which traverses uneven country, because the sky wire is securely held against strains in all directions. On the lines of the Kansas Gas & Electric Company employing this device the sky wire is grounded at every pole.



POSITION OF SKY-LINE CLAMP ON POLE, AND DETAIL

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

SELECTION AND PROMOTION OF UTILITY EMPLOYEES

Details of a Plan of Personal Record of Employees Which Has Been in Use Many Years as a Guide to Promotions and Transfers

BY ARTHUR WILLIAMS
General Commercial Manager New York Edison Company

Many utilities have come to realize during the past three years the necessity for having a systematic policy with regard to selecting, training and promoting employees. In this period of reconstruction there will undoubtedly come an opportunity for making a definite plan for properly handling labor so that employee fitness may be a known quantity rather than a shrewd guess.

As a result of years of effort on the part of the New York Edison Company given to the development of a plan of employment and promotion, three of the most important conclusions which have been arrived at are that it is absolutely essential that the employment and promotion of the employee should not be haphazard, that promotion should not be acquired through pull, and that there should be equality of opportunity for the development of every employee and equality of reward according to the development of every employee.

One of the biggest problems confronting industry today is "men," namely, all workers who make up the organization, from the office boy and the stenographer to the president. Employment and promotional plans should all have for their ultimate aim the proper selection, training and advancement of the employee, for promotion and growth are the very life of a business institution.

In the New York Edison Company vacancies are filled from the ranks. Making promotions or transfers involves a big question. If we have an employee in our plant capable of filling a better job, we give him his chance, regardless of how well he may be performing a particular task. For the happy and satisfied worker is an asset to the company, whose interests are best served when the individual is allowed to grow and develop. The returns will be mutual.

To solve the question of promotion and transfers the New York Edison Company has devised a plan of keeping a personal record of each employee. The records are kept by an assistant to the manager of our bureau of education, who has charge of employment for his division of our company, which includes sales and handling of all matters pertaining to our relations with the public. The record shows the employee's age, education, time in the service of the company, history of such service, history of work done before entering the present employ and condition of his health. It records his accomplishments in educational courses, tardiness, absences, attitude of individual toward his duties; whether prompt, accurate and the amount of supervision he requires; whether he works well with other employees; whether ambitious, willing or adaptable; whether he possesses executive ability; whether sufficiently adapted to his work and sufficiently trained to render acceptable service. Often the record may indicate the fitness of the employee for a better position. To a large extent it registers his native ability.

We have had our system of records in use for five or six years and have found that, when conscientiously compiled, the record will reflect a fair picture of the individual employee's characteristics and general worth. Our managers must be exceedingly liberal, fair and unselfish regarding the question of transfers and promotion, for upon it depends the personality and spirit of our organization.

FLAT-RATE ADJUSTMENTS FOR LIGHTLESS NIGHTS

Iowa Property Charges 50 per Cent as Readiness-to-Serve Charge and Prorates Balance According to Hours of Use

The Citizens' Gas & Electric Company of Waterloo, Iowa, has developed an interesting method of handling flat-rate contract business on lightless nights which applies to sign and show-window lighting as well as to street lighting. To arrive at the selling price the company takes first 50 per cent of the contract price, to which is added the balance of the contract price prorated for the actual time in operation.

As an illustration, if the contract price is $4 per month per lamp and the actual operating time was twenty-five hours for the month compared with a total schedule of 100 hours for the month, the company would bill:

First:	50 per cent of $4	$2.00
Second:	25 per cent of $2	0.50
Total		$2.50

While the 50 per cent of the contract price used in the first instance as the basis of the charge is purely an estimate, it is based on what the officers of the company believe is sound reasoning. Careful consideration will show easily that a certain part of the flat-rate price is made up of fixed charges which do not vary materially as long as the contract price is in force, whether the electricity is actually furnished or not. These charges are made up of the usual readiness-to-serve expenses.

Austin Burt, manager of the Waterloo company, states that the Citizens' Gas & Electric Company has experienced no trouble in securing payment of accounts on this basis.

EFFECT OF VARIOUS ORDERS CONCERNING FUEL ECONOMY

Conservation Measures Decreased Revenue of Large Station 10 per Cent—Daylight-Saving Law Decreased Revenue of Another Company

A Middle Western company which operates a 15,000-kw. station in a city of 50,000 population reports that its income was affected to the extent of about 10 per cent by various fuel-economy orders and that the saving in coal was approximately 2000 tons. These figures are largely a matter of estimate, however, being based upon the differences between the last week of the daylight saving and the first week of the old system. It is the belief of the manager, nevertheless, that the figures are approximately true.

Another and smaller Middle Western company, which serves hydroelectric energy to a population of about 15,000, reports that the lightless nights have not affected its income to any extent because it is solely a water-power property. The daylight-saving law, however, did reduce its receipts from lighting about 15 per cent.

PROTECTION AGAINST THIEVING CUSTOMERS

Investigation Brings Out that Meter Protection Will Result in Decrease in Waste of Energy Besides Increase in Revenue

BY C. W. WARD
Formerly Superintendent of Laboratory Duquesne Light Company

With the view of determining how to protect itself against the theft of electrical energy, the Duquesne Light Company of Pittsburgh, Pa., recently conducted an investigation into the cost of, and returns from, the installation of meter-testing and protective devices on both new and existing services. The conclusions reached were that not only would there be a decrease in the loss of energy, but a substantial increase in revenue would be effected.

One of the first decisions reached, even before the total investigations were completed, was that in all cases where intentional irregularities were found to exist one of the terms of the settlement was the installation at the customer's expense of iron-clad service and a protective device.

Records of the contract department of the company during the period from Aug. 1 to Nov. 1, 1917, show that seventy-nine irregularities were detected, of which sixty-seven were reported by meter testers, ten by district meter men and two from other sources. Because the meter installers do not make any special effort to detect cases of irregular wiring, these figures represent only the most apparent cases, or those in which no particular effort at concealment had been made.

During these three months there were 3884 meters tested, and of that number there were 1095 meters which in the opinion of the investigating committee were not liable to irregularities, being mostly power meters. The remaining 2789 meters were liable to tampering and of these, as shown above, sixty-seven, or 2.4 per cent, were found irregular. The committee was convinced that there were enough thieving customers sufficiently clever to conceal their irregularities to justify the assumption that 5 per cent of the customers were indulging in this practice. Five per cent of the existing customers means that 3000 are regularly stealing energy. Statistics from the contract department show that the average annual revenue per lighting customer is $20. Therefore, if these 3000 customers were not stealing energy, their total returns to the company would be $60,000. Because they are stealing, their revenue drops off to their minimum of $6 each annually, or a total of $18,000.

In addition to this loss is the one represented by the difference betwen the consumption when the energy is being properly metered to such customers and the actual registration which such customers generously permit to occur. In other words, it was estimated that a deliberately thieving customer uses an average of 600 kw.-hr. per year, of which only 240 kw.-hr. is metered. This represents a loss of 360 kw.-hr. annually per thieving customer, which amount would be saved by the proposed new type of installation.

At an estimated cost of 2 cents per kilowatt-hour for delivery, this loss of 360 kw.-hr. would, if prevented, result in a saving of $7.20 annually per irregular customer, or a total of $21,000 for 3000 customers. Therefore the actual total saving effected is represented by an increased revenue of $42,000, which is the difference between $60,000 and $18,000 shown above plus the saving of $21,000, or a total of $63,000.

Estimates were made of the cost of equipping with iron-clad service and protective devices the various classes of customers served, and this was found to be $8 each, or for the 62,500 customers a total of $500,000. It was calculated that it would require thirty-five men a period of three years to do this work, entailing an annual expenditure of $166,000. Such an outlay would represent a capital account and would cost a total of 13 per cent divided as follows: Interest, 7 per cent; depreceiation, 5 per cent; maintenance, 1 per cent. The annual investment of $166,000 would then at 13 per cent cost annually $21,500. As theft of energy would be practically eliminated at the end of three years, the total annual saving effected from then on would be the $63,000 shown above, while the cost of the money for the installations for the three years would be $64,500. This would, of course, represent an excellent investment.

Owing to the great scarcity of labor, it was decided that the installation of such devices on the premises of existing customers could not be undertaken at the time, but that all new wiring jobs must be so equipped. Instructions were issued to all wiring contractors to that effect, and a system of issuing the devices, as well as locating the point of service entrance, was instituted. It was estimated that 4000 "safety switches" would be required annually for the new wiring jobs, all to be installed by the contractors. The only expense to the company would be the first cost of the box plus handling and delivery, or a total of $3 each, representing an annual investment of $12,000. This plan has been in successful operation for some time.

Each "safety switch" is equipped with wiring diagrams for both two-wire and three-wire installations. Reference copies of the diagrams were sent to every wiring contractor. The two diagrams are on the same sheet.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

An A. E. G. 55,000-Kw. Turbo-Generator.—Leading particulars are given concerning a turbo-generator of 60,000 kva. now being built by the A. E. G. for the large power station of the Rhenish-Westphalian Electricity Company. This station follows B. Goldenberg's designs and is situated in the brown-coal area near Cologne; a second similar 60,000-kva. machine will be added, so that, including six 15,000-kw. sets, the total plant capacity will be 200,000 kw. The new machine yields 55,000 kw., 7000 volts, three-phase, at 1000 r.p.m. with 220-volt excitation. The turbine is supplied with steam at 12 atmospheres gage pressure, superheated to 325 deg. C. and condensing water at 27 deg. C. The generator and turbine are each within a single housing. The turbine weighs 250 tons (rotor 49 tons), and the generator 225 tons (rotor 106 tons); total, 475 tons.—*Science Abstracts, Section B,* September, 1918. (Abstracted from *Elekt. Zeits.*, 39, May 9, 1918.)

New Graphical Representation of a Winding Scheme.—The principle of this representation consists in showing the winding scheme by a continuous undulating line, the conductors being represented by vertical lines, the lateral connections by horizontal lines, and in assigning to each conductor a number corresponding to its position in the coil without taking account of its position in regard to the poles. For instance, if in an undulating winding the step is 11, two neighboring conductors will carry the numbers 1 and 12, the following one 23, etc. The author gives finally examples of the application of the scheme to a series-parallel winding and to a three-phase winding.—*Revue Générale de l'Electricité,* Sept. 7, 1918. (Abstracted from *Elektrot. Zeits.*, Feb. 14, 1918.)

Lamps and Lighting

New Arc for Electric Searchlights.—V. BELLINI.—To avoid the flaming of the Beck and Sperry arcs, the author proposes to cool the positive carbon, instead of the arc, by an air jet. Another important result is obtained in this way, namely, that the arc pressure is reduced to 50 volts, the voltage of the Beck and Sperry arcs being 70 volts. The new searchlight comprises three electric motors. One is used for slowly rotating the positive carbon, another for the centrifugal pump producing the air jet, and a third one energizes an aspirator for extracting the smoke produced by the combustion of the carbons. The air jet discharges itself under positive carbon through a rectangular slit. As actually constructed, the apparatus absorbs 120 amp. The Italian military authorities have adopted this device for transforming the ordinary searchlights. Special care is required in choosing the carbons. The copper sheath must not be thicker than 6/100 mm., as otherwise the drops of molten copper damage the mirror. The core of the positive carbon must not have too low a melting point and must be formed chiefly of cerium salts.—*Science Abstracts, Section B,* September, 1918. (Abstracted from *Elettrotecnica,* 5, July 25, 1918.)

Notes on Illumination in Stores and Factories.—FREDERICK J. PEARSON.—An absolutely uniform lighting system in an establishment is inferior to a fairly uniform general lighting system reinforced by special lighting where necessary. Artificial lighting is used only for a small portion of the twenty-four hours and should be intensified to stimulate production. Efficiency, while important, should not always receive consideration to the exclusion of other factors which may result in greater satisfaction, increased sales in a store, etc. Local conditions must govern design. Light conditions in most factories are poor. Good lighting increases production just as it increases sales in a store. Increases of illumination intensity from 6 to 10 ft.-candles have increased the cost of lighting by only 1 per cent and have been found to promote sales by 6 or 7 per cent. Increase of lighting cost of 2 per cent in one installation was reflected in an increased factory production of 10 per cent.—*Transactions I. E. S.*, Oct. 10, 1918.

Incandescent Lighting in War Time.—G. H. STICKNEY and T. W. MOORE.—The authors call attention to the fact that practice in illumination is not only affected by the fuel-conservation measures but also by the necessary manufacturing, transportation and other activities which must be conducted as speedily, efficiently and safely as possible. Luxuries must be restricted so that effort and material can be diverted toward more necessary enterprises and all unnecessary waste must be eliminated. In view of the effectiveness of good lighting, attention is called to some data furnished by the Commonwealth Edison Company showing that when illumination at 4 ft.-candles was tripled a record of production on eight different processes showed an average increase of 15 per cent. The writers then review the trend of the times regarding industrial lighting codes, protective lighting, lighting curtailment and the elimination of waste.—*General Electric Review,* October, 1918.

Generation, Transmission and Distribution

Electrical Mining Machines.—G. ROUET.—A comparison between the direct three-phase system and the Leonard system for the electrical control of mining machinery. The author holds that while at first sight the three-phase system is by reason of its simplicity the more attractive, the advantage with the machines in use none the less remains with the Leonard system, from the point of view alike of the precision of operation and the reliability of performance, of the repercussive effect on the central station, and of the economic results of

exploitation.—*Revue Générale de l'Electricité*, Sept. 28, 1918.

Losses by Foucault Currents in Massive Armored Conductors During Transmission.—The importance of these losses is dwelt upon, and the error that lies in calculating output without adding to the losses by short circuit the losses in transmission due to the distortion of flux in the armor is pointed out.—*Revue Générale de l'Electricité*, Sept. 7, 1918. (Abstracted from *Archiv. f. Eléktrot.* in *Elekt. Zeits.*, June 18, 1918.)

Development of Steam-Boiler Baffles.—ALBERT A. STRAUB.—Power-plant engineers are frequently required to develop modifications and changes in the standard method of baffling boilers in order to meet smoke-ordinance requirements of cities and also to increase the economy and flexibility of units operating under their direction. In developing the different types of baffles described, the ultimate purpose in each case was to obtain maximum economy and capacity consistent with the primary feature for which the baffle was designed. An extensive table giving tests of eighteen-tube wide, thirteen-tube high Babcock & Wilcox double-deck water-tube boilers equipped with Roney stokers of 80.8 sq.ft. (7.5 sq.m.) grate area are presented.—*Power*, Nov. 5, 1918.

Traction

Swiss Report on Corrosion by the Earth Currents of Electric Railways.—The corrosion of gas and water pipes and of the sheaths of cables has given cause for considerable complaint in Switzerland, particularly in two towns, and on this account the above-mentioned joint committee was formed. Trouble on a large scale has been experienced only in the larger towns with concentrated direct-current tramway services. The committee has drawn up a program of work consisting of five different parts as follows: (1) General report on the question of corrosion and methods of protection; (2) collection and utilization of the results of experience; (3) results of measurements on typical tramway systems; (4) regulations for the construction and maintenance of installations; (5) organization of a permanent controlling body. The present report refers to the first section only. It is divided into two parts: the first is theoretical and discusses the production of corroding currents and their laws of flow; the second part reports on the magnitude and nature of corrosive effects and their causes.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Schweiz. Elektrot. Verein*, July, 1918.)

Electric Traction and Hydraulic Power in Italy.—The author of this article considers that the three-phase system for electric railways has an unfavorable influence upon the national economy of Italy, as the peculiar frequency, separate apparatus, losses in the line, etc., influence detrimentally the cost of the energy both for railways and for private consumers and are inconvenient for a rational and economic utilization of the hydraulic forces. An example shows that if the three-phase railway were replaced by a direct-current one, the cost of the installation would be diminished by 15 per cent and the cost of the energy for traction by 52 per cent. The relatively high cost of production of three-phase energy for traction leaves a very moderate profit for the energy seller, who consequently is obliged to charge more to the private consumer in order to balance matters: this constitutes an unfavorable condition for the general national economy.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Elettrotecnica*, 5, June 25, July 15, 1918.)

Installations, Systems and Appliances

Automatic Fire Extinguisher for Transformer and Oil-Switch Chambers.—K. PERLEWITZ.—In conjunction with the Salzkotten Works for explosion-proof containers, the firm of Siemens & Halske has developed an automatic fire-extinguishing equipment for use with transformer or oil-switch chambers. A thermally sensitive device in the chamber to be protected closes a relay circuit when the temperature in the chamber exceeds a predetermined limit. The effect of this is that a tank of sulphuric acid is emptied into a potassium carbonate solution and the CO_2 liberated is carried by a pipe line to the chamber where fire has broken out. The chamber is filled quickly with CO_2 and the fire is stifled. At the same time one or more alarm bells are rung, the ventilating chimney in the roof and the oil outlet in the floor of the chamber are closed, and valves in the CO_2 pipes leading to the chamber affected are opened. Description of an actual installation is given with dimensions of apparatus.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Elekt. Zeits.*, May 23, 1918.)

Telegraphy, Telephony and Signals

Determination of the Characteristics of Three-Electrode Vacuum Tubes.—J. M. MILLER.—This paper described a new method for determining the amplification constant and internal resistance of such tubes directly and rapidly. The method is based upon Vallauri's equation, $i_p = av_g + bv_p + c$, giving the relations between the grid voltage v_g, the plate voltage v_p and the plate current i_p. In this equation a is the slope of the (plate current) — (grid voltage) characteristic, and b is the slope of the (plate current) — (plate voltage) characteristic.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Inst. Radio Eng. Proceedings*, 6, pp. 141-148, June, 1918.)

An Electric World Girdle.—EDWARD RAYMOND-BARKER.—The writer discusses the feasibility of telegraph lines completely encircling the globe. Secondary considerations, such as the total cost of such a project and the possibility of making it a paying proposition, are considered.—London *Electrical Review*, Oct. 25, 1918.

Miscellaneous

Economical Use of Coal in Railway Locomotives.—In addition to the discussion of problems peculiar to the burning of coal in locomotives, the subjects of selection, purchase and storage of coal are also considered.—*University of Illinois Bulletin*, Sept. 9, 1918.

Seeking Defects in Castings Made from Magnetic Metals.—Two small magnets are applied together on the metal casting. They comprise two windings, the primary one connected with a transformer. Both windings are connected with a buzzer. The two buzzers have the same tone. A flaw, in modifying the circuits, causes a difference of tone between the two buzzers which indicates its location and the importance of the defect.—*Revue Générale de l'Electricité*, Sept. 7, 1918. (Abstracted from *Schweiz. Bauzeitung*, March 16, 1918.)

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities
in the Technical, Commercial and
Manufacturing Fields

UNLIMITED STORAGE ON BITUMINOUS COAL

All Restrictions Removed by the United States Fuel Administration in Conformity with Action of War Industries Board

All storage restrictions on bituminous coal were removed on Nov. 22 by the United States Fuel Administration in conformity with the action of the War Industries Board in canceling its preferential industries list. Anthracite coal is not affected, however, by the ruling of the Fuel Administration.

Every industry and every householder in the country now may store as much bituminous coal as desired or obtainable, as the action of the War Industries Board removes the necessity for the Fuel Administration to distinguish longer among different classes of industrial plants.

The restrictions just raised provided for the accumulation by the consumers in the preference classes defined by the War Industries Board of reserve stocks of bituminous coal in accordance with their location in relation to various mine fields and their classification on the preference schedule.

All industries located farthest from distribution points, particularly those in New England and in the Northwest, are found not only to be well stocked, in accordance with Fuel Administration specifications, but in many cases have surpluses above those amounts.

THE "LIGHTLESS NIGHT" ORDER IS SET ASIDE

Text of Dr. Garfield's Regulation, Effective on Nov. 23—State Administrators May Continue Rules in Whole or Part

The order of Dr. H. A. Garfield, United States Fuel Administrator, setting aside the "lightless night" order follows:

The United States Fuel Administrator, acting under authority of an executive order of the President of the United States, dated Aug. 23, 1917, appointing said administrator, and of subsequent executive orders, and in furtherance of the purpose of said orders and of the act of Congress therein referred to and approved Aug. 10, 1917, hereby orders and directs that the order of said administrator dated Nov. 7, 1918, establishing a regulation entitled "Regulation restricting the use in cities, villages and towns of light generated or produced by the use or consumption of fuel," and the regulation established by said order, be, and the same hereby are, vacated and set aside as of the effective date of this order; provided, however, that if the federal fuel administrator for any state shall, by an order in writing signed by him, provide for the continuance of said regulation or of any of the restrictions thereby imposed on the use of light, then such regulation, or the restrictions specified in the order of such federal fuel administrator, shall remain in full force and effect within such state until other or further order in the premises of such federal fuel administrator or of the United States Fuel Administrator.

This order shall be effective Nov. 23, 1918.

APPROVES THE LAMP CONSERVATION PLAN

Fuel Administration Indorses the Production Program of the Lamp Manufacturers' Committee and Recommends Conformity to It

G. T. Allen, acting director of conservation of the United States Fuel Administration, has written to J. W. Lieb, chairman of the lamp manufacturers' committee, that the administration approves the plan of lamp conservation which has been adopted.

Mr. Allen, acknowledging the receipt of transcripts of the proceedings at the meetings held on Oct. 16 and 23 by the committee of which Mr. Lieb is chairman, appointed July 15 to consider a plan for the conservation of fuel by limitations on the production and distribution of inefficient incandescent electric lamps, adds:

"After careful consideration of the production program for manufacturers of incandescent lamps which was considered and adopted at the meetings above referred to, the Fuel Administration is of the opinion that its execution will effect a substantial saving of fuel.

"The Fuel Administration therefore desires to record its approval of this program and its recommendation that the several manufacturers affected shall conform to it in the interest of fuel conservation."

A memorandum of meetings of the manufacturers of carbon and "gem" lamps on the two dates mentioned follows:

"At these meetings the manufacturers agreed to accord their hearty coöperation in carrying out the program approved by the Fuel Administration affecting the conservation of fuel by limiting the use of inefficient incandescent lamps, confining their use to conditions where the application of high-efficiency lamps is impracticable owing to excessive vibration or rough service handling.

"In order to carry out the general program already accepted by the users and distributers of incandescent lamps the manufacturers voluntarily offered to limit their production of the inefficient types and discourage their use as far as practicable in their advertisements and sales literature.

"The manufacturers represented at the meetings, those not directly represented having formally signified their coöperation by letter, unanimously offered to support the production program, each manufacturer voluntarily offering to adjust his production to the quota he presented as his individual proposal, as a war measure and in the interest of fuel conservation."

TORONTO WELCOMES AMERICAN ELECTRICAL ENGINEERS

Features of Ontario's Hydroelectric Power System Outlined and St. Lawrence River Crossing Near Three Rivers Described

The three hundred and forty-fourth meeting of the American Institute of Electrical Engineers was held in Toronto, Ont., on Friday and Saturday of last week. The sessions were held under the auspices of the Toronto Section, which has shown remarkable growth and renewed activity under its chairman, Arthur H. Hull. Two papers were presented at the Friday afternoon session in the Engineers' Club, one on the power developments in Ontario by Arthur H. Hull, assistant engineer of the Hydro-Electric Power Commission of Ontario, and the other on the equipment of the Canadian Northern tunnel under Mount Royal, Montreal, by W. G. Gordon, transportation engineer of the Canadian General Electric Company.

At the Friday evening session, held at the University of Toronto, S. Svenningson, designing engineer of the Shawinigan Water & Power Company of Montreal, described the overhead transmission line crossing the St. Lawrence River. An informal dinner was given earlier in the evening at the Engineers' Club, at which time Sir Robert Falconer, president of the University of Toronto, spoke most interestingly of his observations on the battlefields of France.

Technical excursions were made on Saturday to the Leaside munition plant, the electric-steel plant of the British Forgings Company and the Hydro-Electric Power Commission's laboratories and 110,000-volt substation. Every attention was shown the American engineers by their Canadian hosts, whose bounteous hospitality was acknowledged by Secretary F. L. Hutchinson for the Institute and the American visitors.

The immense system of the Hydro-Electric Power Commission of Ontario, covering the Province of Ontario, was given in outline by Mr. Hull, who also included some data on the commission's latest development at Niagara Falls. Between Lakes Erie and Ontario there is a difference in elevation of 330 ft. (100 m.). The greatest head now utilized on the Canadian side at Niagara Falls is about 160 ft. (54 m.). To obtain the greatest amount of power from the water available, after careful surveys and studies, it was decided to locate the generating station just above Queenston, and to take water from the Niagara River, through the Welland River (reversing the flow) and canals encircling the city of Niagara Falls to Queenston. The first canal is now under construction.

The total length of waterway from the Niagara River to the generating station site is about 12½ miles (20 km.), 4¼ miles (6.8 km.) of this distance being in the Welland River and the rest in an excavated canal. The net effective head will be about 305 ft. (93 m.), and the first canal is normally designed for 10,000 cu.ft. (283 cu.m.) per second at minimum low water.

The generating station will be about one mile up stream from Queenston, in the gorge just at the end of the last rapids in the river. At this point the banks are steep and short penstocks only will be required. Provision is being made for extensions, and right-of-way for two more canals has been purchased. To show the effect of utilizing the greatest possible head of water, it was pointed out that about 30 hp. will be developed for each cubic foot per second in this development, whereas about 14 hp. is all that is obtained in existing plants at Niagara Falls.

The development now under construction is designed, as regards canal, forebay, gatehouse substructure and power-house substructure, for a capacity of 300,000 hp. It is proposed to construct the gatehouse and power-house superstructure for an initial installation of 200,000 hp. in four units. The designs are made so that extensions of power house and gatehouse can be made to almost any extent. Future plans contemplate the use of 100,000-hp. units.

The turbine speed has been fixed at 187.5 r.p.m., and specifications for the generators are now being issued calling for 45,000-kva., 85 per cent power factor, 12,000-volt, three-phase maximum-rated generators of vertical type equipped with thrust bearings to take the weight of the rotating part of the generator plus the downward thrust of the turbines.

Mr. Svenningson's paper dealt with some remarkable construction recently completed by the Shawinigan Water & Power Company near Three Rivers, Quebec. The St. Lawrence River is crossed by transmission-line wires on a span of 4800 ft. (1463 m.), this being the longest span in the world. Owing to necessities of navigation clearance, the towers are 350 ft. (106.6 m.) high.

Three lines of cable 50 ft. (15.2 m.) apart span the river between the two towers. The cables are 1⅜ in. (34.9 mm.) in diameter, made of galvanized plow steel. They are composed of six strands of nineteen wires each and a stranded core of thirty wires. It was originally intended to use the main cables as conductors and to insulate them from the tower by specially designed insulators. Unfortunately these insulators were not completed in time for erection, and for the present the main cables are used as messengers from which No. 1/0 stranded copper conductors are suspended. These suspended lines are supported every 250 ft. (76.2 m.) by suspension insulators of eight units to a string. The insulators which will be used eventually when the steel lines act as conductors consist of a large ring girder and two spiders.

The ring girder is 8 ft. (2.4 m.) in diameter and made up of two 9-in. (22.8-cm.) channels 12 in. (30 cm.) apart, with ⅜-in. (9.5-mm.) cover plates The upper spider is connected to the ring girder by means of three 2½-in. (6.2-cm.) bolts 10 ft. (3 m.) long, one at the end of each spider arm. The center spider is supported on the ring girder by six porcelain insulators of eight skirts each, two insulators at the end of each spider arm. The clear distance between the spiders is about 36 in. (91 cm.).

The porcelain insulators used are special compression insulators having a tested breaking strength of 60 tons each. This is about four times the estimated maximum load. Electrical tests showed a dry flashover of 302,000 volts and a wet flashover of 262,000 volts. The completed insulator has a net weight of approximately 6 tons.

The crossing has been in uninterrupted service now for about nine months. The provisions for protecting the towers from ice flows were described.

RAPID READJUSTMENT IN POWER APPARATUS

Bulletin of the Electrical and Power Equipment Section of the War Industries Board Shows Quick Progress

In Bulletin No. 2 on "Readjustment Plans," dated Nov. 21, the electrical and power equipment section (of which Walter Robbins is chief) of the War Industries Board says in part:

"*Priorities and Preference List.*—The Priorities Division has prepared for printing Circular No. 58, which may be briefly summarized as follows.

"Preference list and all supplements thereto are canceled as of Nov. 22. All specific and automatic priorities are canceled as of Nov. 22, save those in favor of the navy, the emergency fleet, the United States Railroad Administration, telegraph and telephone companies. The circular also provides that where exceptional necessity is shown, after careful investigation, specific priorities other than those mentioned above may be issued.

"You are, therefore, permitted to accept orders and make deliveries of all classes of apparatus and for any purpose where such deliveries are not in interference with priority orders on your books for the agencies mentioned above, and to readjust your schedules according to your own best interests.

"Section 2 of Circular 58 calls attention to the fact that the cancellation of priorities does not cancel the order.

"*Pledges.*—By virtue of the fact that the preference list has been abolished, you are hereby entirely released as to pledges addressed to the priorities committee.

"*Restricted Industries.*—A number of industries coming under the direct supervision of this section have been working under various degrees of curtailment by virtue of circulars issued by the Priorities Division. These are as follows: the vacuum-cleaner industry, washing-machine industry, electric heating appliance industry, fan-motor industry. You are hereby advised that all restrictions are now lifted and that your pledges filed in accordance with the provisions of such circulars are canceled.

"*Circular No. 23, Jobbers and Dealers.*—This circular is hereby canceled and withdrawn.

"*Monthly Reports.*—We suggest that you prepare your P. C. Form No. 21 for November, and, as stated in Bulletin No. 1, maintain your own machinery for preparation for similar report for December, if wanted. We cannot now see that the information for November will be useful to us; therefore suggest that you do not mail it unless we find a necessity later on. This is in line with our desire to refrain from seeking unnecessary information, and, of course, applies only to those industries under your jurisdiction which were under that system.

"*Our Future Duties.*—We are proceeding with all possible speed to review our files, put them in shape for future reference, to make explanations in connection therewith where it seems necessary, and in writing the history of our activities. We shall still probably be called upon for some service in connection with the various government agencies in connection with cancellations or tapering-off programs. So far as we can see, when this work is finished we are finished. In the meantime, if we can perform any service for you, please call on us.

"*Conservation.*—Positions with reference to general conservation and standardization are now quite as expressed in Bulletin No. 1; that is, schedules will not be promulgated from here except upon specific request from each war service committee having the schedule in charge. In the absence of request, we will understand that the schedule is not to be promulgated.

"The War Industries Board, however, fully recognizes the desirable nature of many features of the programs of conservation and standardization which have been prepared, believing that a thoroughgoing standardization of our industries will have a far-reaching effect on international competition through providing a basis for organization of such industries on a national scale. In this connection it will be of interest to quote the following paragraphs from a recent statement by Mr. Baruch:

"(a) Discussing the matter of conservation and standardization, Mr. Baruch called attention to the opportunity which exists for the country to make of a matter of necessity a matter of advantage. The various measures undertaken, he observed, had been projected and carried through under the stress of the war program—each measure taken up with the individual industry involved, and no attempt made to establish a general policy. The results achieved even in that way, he declared, justified, in his belief, a suggestion that the whole subject should be transferred to one of the permanent agencies of the government. Properly conceived, he declared, a policy of industrial conservation and standardization in time of peace would make for a saving in materials, money and labor, and a consequent increase in productive capacities. Standardization of types and styles in various classes of commodities, he said, would make for cheaper costs of production, and, resulting therefrom, lower prices to the consuming public. The possibilities from such economies, he remarked, constituted one of the great lessons learned from the war.

"(b) At this point the chairman took occasion to pay a warm tribute to the 'spirit of service,' which, he said, possessed to an unvarying degree by American industry in the period of the war, had made the war industries organization of America greater than that of any other country. Each industry, he said, considered itself to be fighting Germany. He relied on a similar spirit to see the country safely through the period of transition.

"Mr. Baruch announced that George N. Peek, commissioner of finished products of the War Industries, Board, had been delegated to represent the War Industries Board in its dealings with Herbert Hoover in the latter's demands for materials needed for the reconstruction work in Belgium. Mr. Peek's headquarters will continue to be in Washington.

"*Steam Condensers—Surface Type.*—On Sept. 9, 1918, all manufacturers of surface-type steam condensers were notified that the manufacture and distribution of this apparatus was to be controlled and regulated by the War Industries Board. The reasons which made such action necessary no longer exist, and the restrictions set forth in our letter of Sept. 9 are hereby removed.

"*Power Equipment—Shipping Schedules.*—The manufacturers of boilers, heaters, condensers, stokers and other power-plant apparatus may discontinue mailing shipping schedules and corrections thereto to this section of the War Industries Board; but it is suggested that the manufacturers themselves continue to make up these records for their own use, and for ready reference in case this board needs the information contained therein to carry out whatever program of cancellation or redistribution may be determined upon."

"Maximum Prices.—It has been decided that all maximum prices promulgated by the price-fixing committee will remain in force for the periods originally contemplated. At expiration each case will be considered individually, and, where justified by conditions then existing, price control may be retained on the present or on a modified basis, or may be withdrawn completely.

"Restrictions on Buildings.—All restrictions as to buildings and construction work of any nature have been withdrawn to-day.

"Steam Turbines.—On May 31, 1918, all manufacturers of steam turbines of 500 kw. or larger were notified that the manufacture and distribution of this apparatus was to be controlled and regulated by the War Industries Board. The reasons which made such action necessary no longer exist, and the restrictions set forth in our letter of May 31 are hereby withdrawn. As stated above, under the caption 'Priorities,' manufacturers will proceed to readjust their production schedules according to their own understanding of the relative importance of their various orders, keeping in mind only priority for the four agencies named."

THE PASSING OF WAR PRIORITIES ANNOUNCED

All Ratings Canceled Except for the Navy, Emergency Fleet Corporation, Railroads, Telegraph and Telephone Companes

B. M. Baruch, chairman of the War Industries Board, authorizes the following:

The Priorities Division of the War Industries Board announces the formal cancellation of all outstanding priority ratings, whether by certificate or automatic rating, excepting those for the navy, the Emergency Fleet Corporation, railroads, telegraph and telephone companies.

The order becomes effective as of Nov. 22, 1918. It in no wise implies cancellation of orders, priority directions and requests, whatever their form, having been entirely disconnected from the placing of orders, their sole purpose and function being to define the relative importance of orders when placed. Furthermore, the full force and effect of the directions prior to that date are retained and preserved for the protection and benefit of those manufacturers who have respected and observed them.

The effect of the cancellation will be to divert to civilian needs on an equitable basis vast quantities of materials in the obtaining of which the military program of the nation had prior claim.

Applications for priority certificates may still be made, but will be granted only when the need is urgent and where it is clearly in the public interest. Nevertheless the Priorities Division, under the new order, not only recognizes the paramount needs of the navy, Emergency Fleet Corporation, railroads, telegraph and telephone companies, but urges the industries of the country without resort to priority assistance to speed up the production and delivery of orders for the repairing of public utilities, manufacture of farm implements, and of equipment for the production and distribution of food, petroleum and natural-gas pipe lines and other facilities, and the operation, repair, maintenance or expansion of mines, coke-oven plants, ore-reduction plants, smelters and furnaces employed in the production of fuels, metals and metal products.

The order further eliminates completely Preference List No. 2 issued by the Priorities Division for the guidance of all governmental agencies and others interested in the production and supply of fuel and electric energy, the supply of labor and the supply of transportation. From time to time however the Priorities Division will promulgate such rulings and make such suggestions and requests in connection with priorities in the production and supply of fuel, electric energy, labor and transportation as changing conditions may require.

The order expresses strong appreciation of the wholehearted support accorded the priority regulations by the industries of the country during the period of active hostilities. Public interest, it goes on to say, demands that the flow of materials, equipment, supplies, fuel, transportation and labor shall now as promptly as possible, but without unnecessary disturbance, be turned back to normal channels.

TERMINATION OF SIGNAL ORDERS AND CONTRACTS

Letter from the War Department Asks for Information "in Order that Prompt and Mutually Satisfactory Action May Be Had"

A copy of a letter from the office of the chief signal officer of the War Department, sent to those interested in the termination of orders and contracts, has been received by the ELECTRICAL WORLD. It follows:

1. As a result of changed war conditions, it will be necessary in many cases in the interest both of the government and of the contractor to effect a termination of existing orders and contracts. The term "termination" does not necessarily mean an abrupt or complete cancellation, but rather such an adjustment as will best safeguard the interests of both parties under the conditions existing in each individual case.

2. In cases where the contractor is willing to so terminate an order or contract and is prepared to state in writing that such termination will not be accompanied by a disturbance of labor in the contractor's plant it undoubtedly will be possible for this office to agree with the contractor upon the terms of such termination and to effect it without referring the matter to other or higher authorities. It is evident that it is desirable in the interest of both parties that this course be followed wherever possible and all unnecessary technicalities and delay in effecting the adjustment thus eliminated.

3. In accordance with the foregoing it is requested that you advise this office immediately upon receipt of this letter: (1) What orders and contracts you are willing to terminate as above; (2) whether such termination would disturb labor conditions at your plant; (3) upon which of such orders you are willing to effect an immediate and complete termination.

4. This information is requested as a preliminary step only and in order that prompt and mutually satisfactory action may be had when those orders and contracts are taken up for consideration, and it must not be construed as a notice of termination.

5. Pending negotiations of this character, it will be to the interest of the government that no additions to or replacements of existing labor be made by you for Signal Corps production.

6. Your reply should be marked for the attention of the undersigned.

By direction of the chief signal officer.

L. J. DE MILHAU, Captain, Signal Corps.

MANUFACTURERS THANKED FOR THEIR WAR SERVICE

Appreciation for Their Hearty Co-operation and Efficient Effort—Would Be Criminal Waste to Set Conservation Programs Aside

A letter addressed to all war service group committees of the electrical manufacturing industry, signed by F. B. Eaves of the electrical and power equipment section of the War Industries Board, expresses appreciation for the coöperation given in the war effort. It is in full as follows:

"1. The work of the War Industries Board of assisting government agencies in building up production having ended, and its functions now being devoted to tapering off programs, we take this opportunity of expressing our appreciation and thanks for the hearty coöperation and efficient effort you have displayed throughout the strenuous campaign, which we realize has been done at great sacrifice to the normal commercial interests of your respective industries as well as to your personal interests.

"2. We feel that the time is just beginning when full advantage should be taken of what has been accomplished on various conservation programs and that it would have the aspect of criminal waste to set them aside and simply revert to pre-war methods and lines, waiting for the pressure of world-wide competition to compel similar conservation, which no doubt would ensue only after many markets had been irretrievably lost to American manufacturers.

"3. It is now a matter for each group to work out of its own volition and in a manner best fitted to the interests of its members, as the authority of the War Industries Board will be automatically canceled upon declaration of peace.

"4. In view of the fact that the army standardization committee will complete its present work on standards and will immediately proceed to draw up a set of standardized specifications for use of various departments of the army, it is hoped that each group war-service committee will hold itself in readiness to assist whenever called upon for information which may be required in the preparation of these specifications."

RESTRICTIONS REMOVED ON ALL NON-WAR CONSTRUCTION

No Further Permits Required—The Action Taken Follows a Careful Canvass of Conditions in Each State

B. M. Baruch, chairman of the War Industries Board, authorizes the announcement that all remaining restrictions of non-war construction throughout the United States were officially removed as of Nov. 21.

The action taken permits all building operations of whatever character held up in the interest of the war program to proceed. No further permits will be required from the War Industries Board or the state councils. A careful canvass has been made to determine whether the conditions obtaining in each state with respect to building materials, transportation and the supply of fuel and labor would warrant a removal of the remaining restrictions.

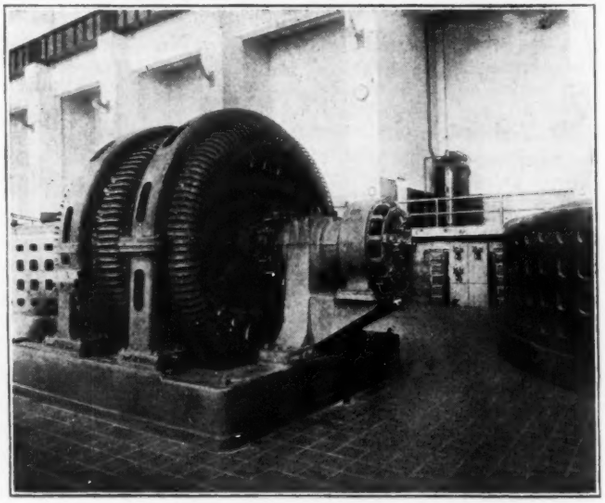
HEAT, LIGHT AND POWER RECONSTRUCTION MEETING

John W. Lieb Will Preside Over Major Group Conference Embracing the Electrical Industry at Atlantic City

John W. Lieb, chairman of the National Committee on Gas and Electric Service, has been asked to serve as chairman of major group No. 2 at the United States Chamber of Commerce reconstruction conference at Atlantic City on Dec. 4, 5 and 6. Mr. Lieb will do so. This group is the "heat, light and power" group, and, according to the plan of organization announced by the Chamber of Commerce, it includes several of the "related groups," which are divided among the "major groups." The related groups classified as associated with major group No. 2 are: Related group No. 4, coal and coke; No. 5, public utilities; No. 11, machinery, tools and power equipment.

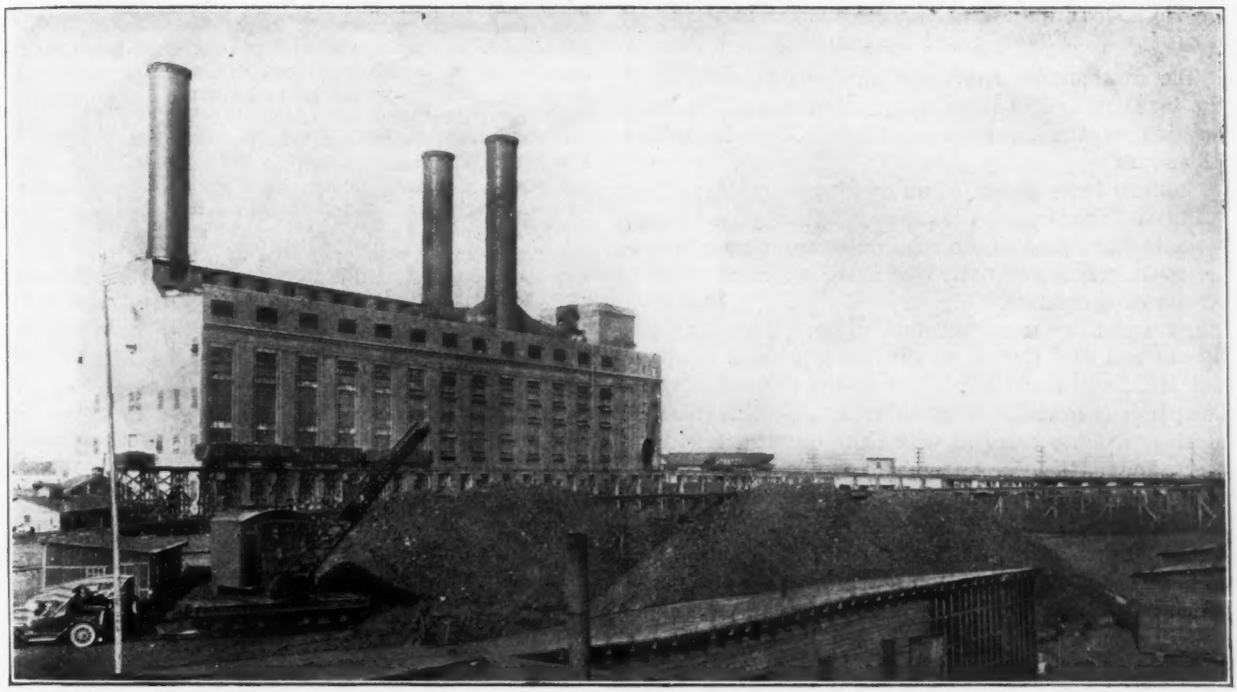
A meeting of the National Committee on Gas and Electric Service will be held at the Marlborough-Blenheim Hotel, Atlantic City, on the evening of Dec. 3.

Central Illinois to Get Energy from Keokuk



The Central Illinois Public Service Company has installed a 2500-kw. frequency changer in the power house of the Mississippi River Power Company at Keokuk, Iowa. Through this unit energy from the hydroelectric plant will be supplied to a transmission system which stretches across the central portion of Illinois. The frequency changer receives energy from the water-driven generators at Keokuk and converts this from 25-cycle energy to 60-cycle energy at 11,000 volts. Lines run through conduit in the dam to carry this 60-cycle, 11,000-volt energy to the Illinois side of the river, where it is stepped up to 33,000 volts in a substation at Hamilton. The line constructed from Hamilton to Colchester is the second connecting link between the Mississippi River Power Company's system and that of the Central Illinois Public Service Company. The line is 32 miles (51 kw.) long. It is expected that its completion will release for the Central Illinois Public Service Company 2000 tons of coal per month, which it can use in producing energy in other plants. It is stated that the building of the line does not reduce the operating expense but gives an additional capacity and reliability to the system and at the same time effects a conservation of coal in the national interests. The energy is purchased as prime power, the rate being on a cents-per-kilowatt-hour basis with a guaranteed maximum load factor.

Coal Stored at the River Station of the Buffalo General Electric Company as a Guarantee of Service This Winter.



Part of the power of Niagara goes to waste while coal is burned at this steam station to increase the supply of energy. The industries in the district were absolutely vital to the nation at war; they are also of great relative importance under peace conditions.

INTERCONNECTION IN EASTERN NEW YORK

Six Companies in Albany and Nearby Cities Effect Substantial Coal Saving in Short Interconnection Test

The following is made public by the United States Fuel Administration:

Coal saving at the rate of 5000 tons a month has been effected by six power companies of eastern New York through the operation of a plan of joint operation and the use of water power heretofore wasted, undertaken at the suggestion of the Fuel Administration. This record in coal conservation was effected without a change in existing equipment or additional cost to the power companies, and the success of the plan has been so marked that the companies interested are anxious to continue it.

The companies which combined and carried out the plan through a joint committee made up of their regular organizations serve what is known as the "Capital District," including the cities and towns of Albany, Troy, Schenectady, Amsterdam, Mechanicsville, Cohoes, Saratoga, Glens Falls and adjacent territory.

Putting the operation of the scheme in the hands of the joint operating committee and using the available resources of the six power companies, a two weeks' test was begun on Oct. 23. In that period electric energy equal to that generated by the burning of 2450 tons of coal was developed from existing equipment and the natural river flow which otherwise would have gone to waste. The generating companies were thus able to market heretofore unused power, and the coal-burning companies were able to get power at a saving over their own costs.

Following are the companies coöperating in the joint operation plan: Adirondack Electric Power Corporation, Glens Falls; N. Y.; General Electric Company, Schenectady, N. Y.; Municipal Gas Company, Albany, N. Y.; Cohoes Power Company, Cohoes, N. Y.; Hudson Valley Railroad Company, Mechanicsville, N. Y., and Schenectady Power Company, Schaghticoke, N. Y.

Some time ago the Fuel Administration, with the cooperation of the power companies, made a thorough investigation of power conditions in eastern New York. As a result of this investigation the power companies were asked to combine in a program of joint operation, a plan made possible by connecting transmission lines already in existence and the substitution of water for steam power. This was promptly agreed to; the available resources of the companies were placed in the hands of the joint committee, and an operating department was appointed to carry out the distribution of water power.

Using the existing equipment and organizations, and without additional labor cost, a two weeks' trial was commenced. At the end of that period, "there was such unanimity of thought," says the report to the Fuel Administration, "that the question of continuing did not enter into the discussion of the joint committee, but simply the endeavor to secure the success of the scheme by agreeing on the cost of power sold by the hydroelectric companies to the coal-burning companies in place of burning coal."

CONTRACTING ENGINEERS ON TRADE AND LABOR POLICIES

Conference Club, Meeting at Pittsburgh, Discusses the Relations That Exist Between the Constructing Engineer and the Industry

The constructing engineers' fundamental relation to the industry and to labor was the keynote of the ninth meeting of the Conference Club at Pittsburgh Nov. 21 and 22.

Sullivan Jones presented an opening discussion of the so-called "Conference Club plan." This plan broadly seeks to functionalize the relation between manufacturer, constructing engineer, consulting engineer and the buyers of equipment.

Discussion by manufacturers present, including Mr. Gibson and Mr. Curtin of the Westinghouse company and Mr. Bobson and Mr. Miller of the General Electric Company, indicated the manufacturer's willingness to consider definite cases in which the constructing engineer showed that he had performed engineering and selling service for the manufacturer for which the latter would be justified in compensating him. The manufacturer broadly puts his position as having specialized engineering service and sales promotion departments which he relies on to get his volume of sales. The constructing engineer urges that when he develops business and becomes responsible for the detailed application of the work his service should be recognized in his discounts as a buyer. The consulting engineer urges that if the customer receives engineering service that really helps him, he (the customer) should pay for it, and the manufacturer and constructing engineer who give such service and do not charge for it as such are not functioning properly.

The suggestion was made that if the classes of business were analyzed and divided into groups, certain very large industrials would stand by themselves, having their own engineering and construction departments and buying direct from the manufacturer; certain others would fall into a second group employing consulting engineers, and certain others in a third group where the contracting engineers would design, sell and install the equipment.

The drift of general discussion indicated the desire of the contracting or constructing engineers to add engineering departments and to design and lay out their work. A paper by E. D. Sickels of the Lord Electric Company provoked an interesting discussion upon "Group or Coöperative Advertising." Mr. Lord offered a prize of $100 to the best advertising suggestion. Discussion by W. L. Goodwin and others indicated the need of selling the idea of the conference plan to the electrical industry before attempting to capitalize the plan in advertising it to the public. A committee was empowered to consider the whole subject.

John R. Cole, vice-president of the Lord Electric Company, submitted for the definite consideration of the conference the so-called national agreement on dealing with labor. Mr. Cole said in part:

> It is not necessary to expatiate on the advantages of cooperating with organizezd labor, as results have spoken for themselves wherever coöperation has been tried. There is no question which can arise between employer and employee which cannot be successfully settled at the conference table by the application of common sense and honest intentions. Another way of expressing this idea is that successful coöperation must come from the heart, and if both parties really wish to coöperate the result is always assured.
>
> As a result of considerable study and consultation with men thoroughly conversant with economic questions, I have come to the conclusion that the most practical and satisfactory way to bring about sincere coöperation in the electrical industry would be to have the Conference Club lend its support and encouragement to a national agreement entered into with the International Brotherhood of Electrical Workers.
>
> There are several industries that now work under a national agreement, and as far as I am able to ascertain such agreements have given general satisfaction and have eliminated unnecessary stoppage of work, as they provide a method of settling all differences without resorting to the strike or lockout. It is superfluous for me to attempt to go into the details of such an agreement, which necessarily would have to be decided in a conference where both sides were equally represented, and drawn up to fit our specific problems. A permanent joint committee composed of three members of the Conference Club and three members of the International Brotherhood of Electrical Workers should be formed whose first duty should be to block out a set of fundamental principles that would form the basis of the national agreement.

Mr. Cole added several suggestions to this general plan, pointing out the necessity of absolute confidence on the part of each party to such an agreement in the other and suggesting that to this end the Conference Club include in its membership representatives of organized labor.

The Conference Club voted to appoint a committee to look into the feasibility of devising a national agreement. Among those taking prominent part in the discussion was J. P. McNulty, representing the International Brotherhood of Electrical Workers.

The meetings closed with a dinner given by the Westinghouse Electric & Manufacturing Company.

CLEVELAND MAXIMUM RATE IS UPHELD BY COMMISSION

Three-Cent Maximum Rate Ordinance Is Adjudged Unjust and Unreasonable—Finding Based on Production Cost in Last Four Years

The Ohio Public Utilities Commission recently announced its decision in the case of the Cleveland Electric Illuminating Company's appeal from the city of Cleveland's 3-cent ordinance to the effect that the company may retain its maximum rate of 10 cents per kilowatt-hour. This maximum, the commission said, is just and reasonable, while a 3-cent rate would be unjust and unreasonable. It does not follow, however, that any considerable part of the charge for service should be based upon the maximum, according to the commission, and in fact it is expected that the greater part will be much below this.

The rate allowed was based upon the cost of production for the past four years, with a determined valuation of the properties fixed at $26,222,216. City officials object to this, on the ground that the cost of operation for two years or more of the four has been abnormal and should not be considered in fixing a rate for the future.

Mayor Harry L. Davis and other city officials declare that the Ohio Supreme Court will be asked to review this decision.

POWER PLANT DEDICATED TO THE LATE HENRY FLOY

New Generating Station of the Yosemite National Park Is Dedicated to the New York Engineer

The ceremony at which the new power plant of the Yosemite National Park was dedicated to the late Henry Floy was held at the plant in the Yosemite Valley, about a mile below the Pohono Bridge, at 10 a.m. on Sept. 7, Stephen T. Mather, director of the National Park Service, presided. The speakers, besides Mr. Mather, were W. B. Lewis, superintendent of the Yosemite National Park; A. J. Robertson of the Mount Whitney Power & Electric Company; M. M. O'Shaughnessy, city engineer of San Francisco; A. B. C. Dohrmann of the Nathan-Dohrmann Company, and Howard H. Hays, manager of the Bureau of Service, National Parks and Monuments, of the United States Railroad Administration.

The plant was dedicated to the late Mr. Floy, the New York electrical engineer whose preliminary study

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THE LATE HENRY FLOY

of the situation, whose report and whose argument before the appropriations committee of the House were chiefly instrumental in securing the appropriation. Mr. Floy died shortly after finishing his report and before the appropriations committee acted favorably upon it. The plant, as completed, cost $213,500.

A plaque upon the power house reads as follows:

YOSEMITE POWER PLANT.

Dedicated September 7, 1918, to the late HENRY FLOY,
Electrical Engineer of New York City,

whose personal interest and professional assistance were contributing factors in securing favorable legislation for its construction.

The new plant consists of a diversion dam 160 ft. (48.7 m.) long across the Merced River a mile below the Pohono Bridge, which delivers water through a wood-stave pipe 6000 ft. (1828 m.) long into a steel pressure pipe nearly 800 ft. (243 m.) long, which falls 330 vertical feet (100 m.) to drive the two Pelton water turbines, to each of which a 1000-kw. generator is connected.

In his address Superintendent Lewis, sketching the history of the project from the great increase of travel to Yosemite in 1915 which made it necessary, said:

It is unfortunate that in government projects of this kind there are often not sufficient funds available to make the extensive studies and surveys upon which to base an accurate, intelligent estimate, and it is therefore necessary to resort to considerable guesswork. This was true in our case. With the meager information at hand, Mr. Floy's report on the situation was comprehensive and reasonable, and his estimate of $150,000 would have sufficed under ordinary conditions.

On the strength of Mr. Floy's report to the Park Service and his testimony before the House appropriations committee during the winter of 1915-16, Congress appropriated the sum of $150,000 for the work. In August, 1916, Galloway & Markwart, consulting engineers of San Francisco, were engaged to design the plant and supervise, from the engineering standpoint, its construction.

The story of the construction of the work as told by Mr. Lewis is one of a struggle against unforeseen difficulties, including the labor shortage resultant from the draft.

Director Mather said in part:

I want to say a word in regard to the great help that Henry Floy, to whom this plant is to be dedicated, was to me during my early connection with the national park work. Mr. Floy was a very busy engineer in New York, an electrical engineer, whose duties carried him all around the country; a man of very high standing in his profession, who had very little time to give outside of that work, but who, when I asked him with the consent of Secretary Lane to assume a position as temporary inspector and to study the work in connection with the parks, consented to do it for merely the nominal salary of such a position, notwithstanding that he was obliged to drop much work for which he was receiving good pay.

He came out to California in 1915 as one of the party who went with me through the high Sierra country. He made a study of the Mount Whitney Power & Electric Company's holdings in the Sequoia National Park. He carried on negotiations with John Hays Hammond, then president of the company, and made an agreement with him by which the revenues from the company for the development of power were increased from a few hundred dollars a year to approximately ten or twelve thousand dollars per year, and the park revenues benefited accordingly.

After making this preliminary study, Mr. Floy prepared a report, but before preparing that report he testified before the appropriations committee in connection with our request for $150,000 for the proposed new power plant. It had looked as if we were not going to get this money at all. Congressman Fitzgerald, then chairman of the appropriations committee, has always been the watchdog of the Treasury, and you had to prove absolutely the worth of any proposition before you could get him to consent to it. The testimony brought out at that hearing was practically the means of our getting that appropriation. I might state that Mr. Floy just within a month of his death made an exhaustive report to the committee in writing, with complete estimates of the power possibilities of the Merced River. The actual appropriation was not made, however, until two months after his death. The splendid work of Galloway & Markwart brought this project to a successful conclusion, but to Henry Floy belongs the credit of laying the foundation.

A. J. Roberston said:

I do not think there could be a greater honor bestowed on a man, or a greater eulogy of his work, than to have dedicated to his memory a power plant like this. Its very permanence represents the permanence of the works a man leaves behind him, and Mr. Floy's work on the public utilities of New York and Brooklyn will live forever, as well as other works which are in every-day use by engineers. I am glad to be here this day and to see the dedication to Mr. Floy of this plant, which represents in concrete and iron the product of a master mind.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electrical League of Cleveland.—On Nov. 14 Prof. R. M. Reering, Western Reserve University, addressed the Electrical League of Cleveland on the subject "Germany's Government."

Electrical Supply Jobbers' Association.—The semi-annual meeting of the Electrical Supply Jobbers' Association will be held at the Hotel Statler, Cleveland, Ohio, on Dec. 9, 10 and 11.

Cleveland Engineering Society.—On Dec. 3 G. Douglas Wardrop, editor *Aerial Age Weekly*, will address the Cleveland Engineering Society on "The War in the Air," illustrated by motion pictures.

A. I. E. E., Panama Section.—An inspection trip to the extension of the Gatun hydroelectric plant and substation occupied the Panama Section of the A. I. E. E. at a meeting held recently. Messrs. Hersh, Grier and O'Connell conducted the trip and explained the project.

A. I. E. E., Schenectady Section.—On Nov. 15 Dr. Sidney L. Gulick addressed the Schenectady Section, American Institute of Electrical Engineers, on the subject "Immigration After the War." Dr. Gulick is particularly familiar with some aspects of the problem on account of long residence in Japan.

A. S. M. E., Chicago Section.—The Chicago Section of the American Society of Mechanical Engineers will hold its annual dinner at the Hotel La Salle on Dec. 13. D. L. Derron will speak on the manufacture of shells. It is expected that a motion-picture film will be used to illustrate manufacturing processes.

Electrical Supply Jobbers' Association, Pacific Division.—The regular quarterly meeting of the Pacific Division of the Electrical Supply Jobbers' Association will be held at Del Monte, Cal., Dec. 5, 6 and 7. The purpose of the meeting, as announced, is to "peaceably assemble to discuss our past, survey our present and prepare for our future."

Western Society of Engineers.—The Western Society of Engineers of Chicago on Nov. 12 organized a gas engineering section. The society now has sections devoted to electrical, mechanical, civil and gas engineering. The following have been nominated as officers for the mechanical and the electrical sections of the society: Mechanical section, chairman, F. J. Postal; vice-chairman, B. A. Gayman; electrical section, chairman, J. R. Cravath; vice-chairman, Harold Almert.

Chicago Electric Club-Jovian League.—A resolution has been presented before the Electric Club-Jovian League of Chicago to change the name of that organization to the Electric Club of Chicago in the interest of simplification.

A. I. E. E., Chicago Section.—On Dec. 19 M. Luckiesh of the National Lamp Works of the General Electric Company, Cleveland, will speak to the Chicago Section of the American Institute of Electrical Engineers and the Chicago Section of the Illuminating Engineering Society on the "Principles of Camouflage." Mr. Luckiesh has an interesting collection of photographs to exhibit.

Oklahoma Utilities Association.—The Oklahoma Gas, Electric and Steel Railway Association and the Oklahoma Public Utilities Bureau were recently merged into the Oklahoma Utilities Association. The new officers are J. J. Owens, general manager Oklahoma City Gas & Electric Company, president, and H. A. Lane, 611 State National Bank Building, Oklahoma City, secretary. The first annual meeting of the new organization will be held in Oklahoma City on Feb. 13, 14 and 15.

Electrical Credit Association.—The Electrical Credit Association of Chicago, meeting at the Hotel La Salle Nov. 21, discussed the following topics: "Post-War Orders and Credits," "Readjustment of Financial Statements Due to Decline of Values After the War," "Changing Industrial Conditions," "Analyzing Public Utility Statements," "Looking Ahead," "How to Handle Railways and Large Industrials," "Trade Acceptance—Use and Procedure," "Interdepartmental Relations," "Approved Methods of Handling Unjust Deductions," and general credit conditions.

Ohio Electric Light Association.—The following subjects have been selected for discussion by the new-business coöperations committee of the Ohio Electric Light Association at its five meetings in the coming winter: "Industrial Electric Heating to Replace War Contracts," "Evils of Low Power Factor and the Improvement of Load Factor," "Basis for Differentiation Between Rates for Primary and Secondary Service Voltages," "Electrolytic Purification of Sewage," "Wartime Public Attitude Toward Utilities," "Electric Heat Treating" and "Domestic Electric Heating."

A. I. E. E., I. E. S. and Western Society of Engineers.—On Nov. 18 the Western Society of Engineers, Chicago, met in joint session with the Chicago Section of the American Institute of Electrical Engineers and the Chicago Section of the Illuminating Engineering Society. This evening had been set apart as ladies' night, and S. J. Duncan-Clark of the Chicago *Evening Post*, who recently returned from France, was the principal speaker of the evening. On Nov. 25, at another joint meeting, fuel conservation was discussed by Preston S. Millar of New York and Harold Almert of Chicago.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Commission Orders Duplication Avoidance.—The Spring Valley (Ill.) Utilities Company recently filed an application with the Illinois Public Utilities Commission to build an 11-mile transmission line from Magnolia to Wenona, Ill., to furnish energy to farm customers along the line and to supply the Wenona Light & Power Company with energy. An objection was filed by the Public Service Company of Northern Illinois contending that it had a transmission line through Wenona and could furnish all energy necessary to permit the Wenona Light & Power Company to shut down its isolated steam plant. The record in the case showed, however, that during past years the Wenona company had repeatedly requested the Public Service company to give it a connection and supply power for the operation of its service at Wenona, but that such applications had been consistently refused on the ground that a load of this character amounting to 75 kw. would burden the circuits of the Public Service company and presumably jeopardize the service to the other utilities served from its circuits. Under the present conditions, however, the Public Service company expressed not only its willingness to take this load, but its desire to do so, "rather than have the territory invaded by other investments." The commission in rendering its decision says: "It appears from the record that the securing of transmission line service in Wenona will be a benefit both to the consumers in Wenona and to the utility. It will likewise result in a large conservation of coal aggregating in total amount about 1500 tons annually. As to the desirability of a connection of this kind there can be no doubt. The issue at present pending before the commission is as to whether the Spring Valley Utilities Company should be authorized to extend its line and take this load or whether the Public Service Company of Northern Illinois should be depended upon for furnishing it. It appears that the construction of this line from Magnolia would require material and capital expenditure, which the country is being urged at the present time to conserve. Proof is not made in the record of the necessity of an interconnection between the circuits of the Spring Valley Utilities Company and the Public Service Company of Northern Illinois. . . . A utility furnishing service in a territory which has consistently refused to take load obviously for the benefit of the community and the public at large can

have no objection if this territory is invaded by another utility willing to furnish such service, and it is not the policy of the commission to offer protection to the original utility under such conditions. However, under the present circumstances the good of the public and the necessities of the nation must receive first consideration. It appears that the rates which will be charged for service to the Wenona Light & Power Company by the petitioner and by the objector are not far different. The commission finds that a connection should be constructed for the rendering of service by the Public Service Company of Northern Illinois to the Wenona Light & Power Company, and that such construction should be completed and ready for operation within forty-five days."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Load for Vaccine Incubation.—A 7-kw. load was taken on by the Colorado Springs Light, Heat & Power Company recently for operating a new and unique industry which has recently been established in Colorado Springs by the National Vaccine Company. This company will manufacture vaccine for the cure and control of various diseases by the process of inoculating large numbers of animals and the generation of the proper serums through their blood. The company is providing a 7-kw. load which will be used for incubation purposes.

Illinois Classification of Accounts Effective Jan. 1.—A uniform system of accounts for electric utilities has been prescribed by the Public Utilities Commission of the State of Illinois and is effective Jan. 1, 1919. The pamphlet giving instructions on these accounts covers 141 printed pages. It includes general instructions, schedule of accounts, balance-sheet accounts, plant and equipment accounts, income accounts and form of statements, surplus or deficit accounts, operating-revenue accounts and operating-expense accounts.

Coal Conservation Propaganda Film.—Good and bad methods of coal-mining transportation, good and bad methods of firing, losses from leaky steam pipes and uncovered steam pipes, losses from leaky steam traps, the use of CO_2 records, and in fact everything pertaining to boiler-room practice in its relation to coal conservation, have been featured in a film entitled "Coal Is King." The scenario for this film was written by Robert June, mechanical engineer of the Diamond Power Specialty Company, Detroit, and the picture was produced by the Ford Motor Company. Such points as the necessity for keeping the boiler surfaces clean are also cleverly brought out. Distribution of the picture is being superintended by Mr. June.

Vehicle Users Prefer Garage to General Maintenance Service.—The experience of the Commonwealth Edison Company in operating its electric truck garage at Jackson Boulevard and Morgan Street, Chicago, has been that the electric truck user prefers to contract with the company for electric garage service alone rather than for the complete garaging and maintenance service which the company has been offering. While the company has not withdrawn its complete-maintenance plan offer, it is now promoting the garaging service with vigor.

Empire Companies Plan Boiler Conservation Plant.—For the conservation of worn-out boilers the Empire Gas & Fuel Company will start the erection of a complete boiler plant at Oil Hill, Kan. It will be another measure of conservation. It is planned to rebuild every boiler at a minimum cost, and it is anticipated that not a single new one will have to be bought for several months. The shop building itself will be 30 ft. by 94 ft. and will be directly south of the larger, modern machine shop. It will have every modern mechanical device that is used in any of the large shops of the country.

Navy Needs Engineers.—Men are needed now by the navy for services essential to the reëstablishment of normal conditions. The Bureau of Navigation has issued a call for several hundred men who can qualify for posts which require specialized ability. Only those men who are registrants of Sept. 12, 1918, or registrants of deferred classifications of previous registrations are eligible. Applications will now be received for training in the Engineer Officer School. Applicants must be high-school graduates and graduates of an engineering course at a recognized technical school, or of equivalent training. The age limit is twenty-one years to forty years inclusive. Further information will be furnished upon application at the United States Navy mobilization station, in the Transportation Building, Chicago, of which Lieut. H. D. Childs is commanding officer.

Farm Plant Manufacturers' Organization.—In order to obtain a priority rating from the War Industries Board, manufacturers of farm power and light plants organized recently a temporary association known as the Farm Power & Light Manufacturers' Association. The first meeting was held in Chicago, Sept. 19, 1918. The association comprises about 80 per cent of the farm-plant industry based on capital invested. Its first work was to collect data from the manufacturers themselves on the amount of material and the amount of labor used in the manufacturing operations. At the same time the manufacturers collected through their distributers information from the users of their equipment as to the amount of labor saved through the use of different appliances operated by the farm power and lighting plants, such as motor-driven pumps, electric irons, vacuum cleaners, lamps, etc. It is considered likely that the association will be continued as a permanent organization. The secretary of the permanent association is G. W. Hafner of Ernst & Ernst, certified public accountants, 1040 Continental and Commercial National Bank, Chicago.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Regulation of Rates.—The act of May 18, 1905, entitled "An act to confer upon the city of Chicago the power and authority to sell surplus electricity and to fix the rates and charges for the supply of gas and electricity for power, heating and lighting furnished by any individual, company or corporation to said city of Chicago and the inhabitants thereof," is in violation of the State Constitution, Article IV, Section 13, providing that no act shall embrace more than one subject, which shall be embraced in its title, according to the Supreme Court of Illinois (120 E. E. 562). A city charter authorizing the city to regulate the rate of a gas company, but providing that company should not be compelled to charge less than $3 per 1000 cu.ft., did not authorize an ordinance fixing rates at 75 cents per 1000 cu.ft., the power given being limited.

Scope of Court's Review of Commission's Acts.—Under the public utilities act, which authorizes the Supreme Court to review orders or decisions of the Railroad Commission by a writ of certiorari or review and provides that the review shall not extend further than to determine whether the commission has legally pursued its authority, including a determination of whether the order or decision violates any constitutional right of the petitioner, and which provides further that the findings and conclusions of the commission on questions of fact shall be final and not subject to review, the findings and conclusions which are not subject to review are those on questions of fact within the jurisdiction of the commission, and the question of mixed law and fact, as to whether or not a corporation is a public utility, so as to give the commission jurisdiction over it, is reviewable, according to the Supreme Court of California (175 P. 466). The Supreme Court may restrain the Railroad Commission from exercising powers which it does not possess, or annul its decree when such unwarranted powers have been exercised.

L. A. Keene, new-business agent of the Baton Rouge (La.) Electric Company, has been transferred by Stone & Webster to the Connecticut Power Company as manager of the Middleton division.

John D. Ryan has resigned as Second Assistant Secretary of War and director of air-craft production to return to his business interests. Mr. Ryan is president of the Anaconda Copper Mining Company and the Montana Power Company.

F. W. Bedard, gas engineer from the general offices of the Urbana & Champaign Railway, Gas & Electric Company at Peoria, Ill., has been chosen to succeed temporarily the late Harry J. Pepper as general superintendent of the company at Champaign, Ill.

Henry I. Harriman, president of the New England Power Company and the first president of the Boston (Mass.) Chamber of Commerce to serve a second term in that office, has been in the public utility field only eleven years. In this short period he has been identified with the initiation and development of one of the largest hydroelectric systems in the country, serving every New England state but Maine and interconnected with virtually all the important central stations in its district. Beginning with the construction of the 20,000-kw. hydroelectric station on the Connecticut River at Vernon, Vt., the system now embraces an extensive chain of plants on the Deerfield River with a large storage reservoir at Somerset, Vt., and an important layout of 66,000-volt and 110,000-volt transmission lines reaching practically every industrial center in middle New England. The upbuilding of this system at first met strong opposition from established central stations, which had with few exceptions been developed along the lines of retail energy supply rather than those of wholesale energy over statewide areas. Mr. Harriman was born in New York City in 1873 and was educated at Wesleyan University and at New York University Law School. His active business career began in 1899 with the American Loom Company, and he later became manager of the Stafford Company, manufacturer of cotton-weaving machinery, holding this position until 1907. He then became vice-president of Chace & Harriman, Inc., Boston and Providence, the organization which has developed the New England Power Company's system. Mr. Harriman is a member of the War Efficiency Board of Massachusetts and the Massachusetts Committee on Public Safety and is chairman of the New England Transportation Conference. He is an officer and director of the Bellows Falls Canal Company and Fall Mountain Electric Company and a director of the Worcester Suburban Electric Company, Gardner Electric Light Company, Central Massachusetts Electric Company, Connecticut River Power Company and Rhode Island Power Transmission Company.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

E. E. Harrington has been appointed superintendent of the Hortonia Power Company at Brandon, Vt.

F. L. Good has resigned as superintendent of the Electric Light & Water Works of Winamac, Ind., to become manager of the Logansport (Ind.) Heat & Power Company.

Frank A. Ketcham, who for many years has been the central district manager of the Western Electric Company, has been appointed general sales manager of the company, succeeding in this work Gerard Swope, who, as previously announced, is at present serving as assistant to General G. W. Goethals in the Division of Purchase, Storage and Traffic of the War Department. On his return from his war service Mr. Swope will resume active charge of the export and foreign business of the company. Mr. Ketcham was born in Saginaw, Mich., in 1875 and was educated at the University of Michigan. He joined the Western Electric Company in 1900, starting at the Clinton Street office in Chicago. Most of his early work was done in the telephone supply end of the business and in 1905 he became telephone storekeeper. A year later he was promoted to the position of chief clerk, and on Jan. 1, 1907, to that of assistant manager. In April, 1911, he was made manager. Two months later he received the additional title of central district manager, with supervision over the Cincinnati, Omaha, Indianapolis and Minneapolis houses. Subsequently the Cleveland, Detroit and Milwaukee offices were opened under his jurisdiction.

F. A. KETCHAM

L. P. Chaney has been appointed chief engineer of the power plant of the Pensacola (Fla.) Electric Company, succeeding J. M. Anderson.

R. A. Sara, sales manager for many years of the city of Winnipeg (Man.) light and power department, has resigned to become connected with the American Cellulose & Chemical Manufacturing Company of New York.

R. V. Slavin has been appointed sales manager of the city of Winnipeg (Man.) light and power department, succeeding R. A. Sara. Mr. Slavin was graduated from McGill University in 1910 and has been connected with the Winnipeg municipal plant for many years.

Howard C. Foss, manager of the Savannah (Ga.) Electric Company, has been appointed acting district manager for Stone & Webster for the Southeastern district. Prior to going to Savannah in 1912 as general superintendent Mr. Foss was manager for the Cape Breton Electric Company, Ltd., Sydney, N. S., another Stone & Webster property.

Obituary

Major John Trumbull, formerly chief engineer of the Connecticut Public Utilities Commission, died recently in France following a surgical operation.

Martin W. Kern, for the past ten years mechanical engineer of the Narragansett Electric Lighting Company, Providence, R. I., died recently. Mr. Kern was a native of Providence and was educated at Brown University. His former professional connections were with the Rhode Island Company at Providence and with Stone & Webster at Boston for several years.

Bertram M. Downs, one of the pioneers in the sales branch of the electrical manufacturing industry, died on Oct. 29 from apoplexy. Mr. Downs at the time of his death was about fifty-five years old and had been connected with the industry for the past thirty-two years. He started as a young man with what is now the Brookfield Glass Company and rapidly worked his way up, taking complete charge of sales. He became secretary of the company at the time of its incorporation in 1898 and in 1894 was elected a vice-president. At the time of his resignation in the spring of 1912 he was also a director in the company. A few weeks later he became associated with the Hemingray Glass Company of Covington, Ky., of which he was general sales manager at the time of his death. "Bert" Downs, as he was familiarly known throughout the entire industry, was one of the charter members of the Electrical Manufacturers' Club and was very active in building the club up. For two years he was secretary of the club, and later he was president for two years. Mr. Downs had a host of friends among the manufacturers, jobbers and contractors, and his genial personality will be genuinely missed.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

COMPETING ELECTRICAL GOODS IN FOREIGN TRADE

Data on Specimen Articles of European, Chinese and Japanese Manufacture Used in Australia and the Far East

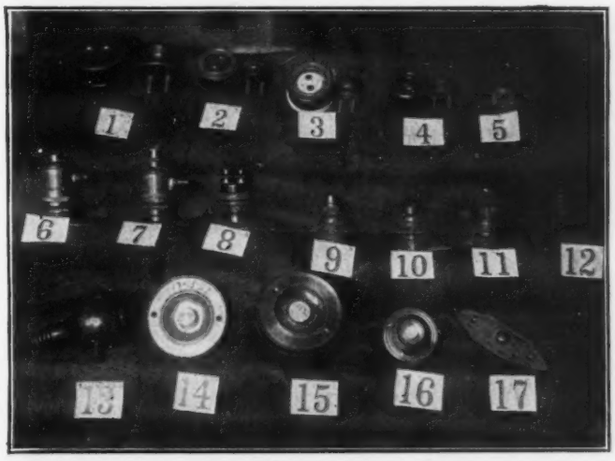
American electrical manufacturers entering foreign markets will have to meet a competition of European, Chinese and Japanese-made goods, generally cheap in price and to which the foreign markets have become accustomed. Some electrical goods have been developed in the United States to meet this competition, but only a start has been made. An idea of what these foreign-made goods are can be had from the accompanying illustrations and the following data. These specimens were collected in Australia and the Far East by R. A. Lundquist, special agent of the Bureau of Foreign and Domestic Commerce. Each article is numbered, and following are given the place of use, where made, price and other details of each according to its number.

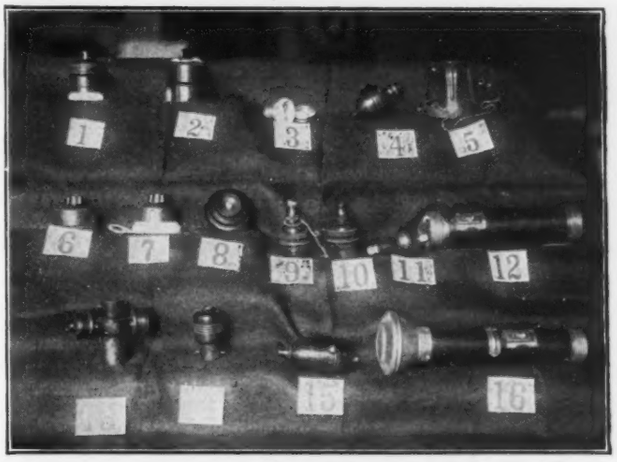
GROUP A.—All items in this group are of English manufacture and were for sale in New Zealand. The collection was made in November, 1916.

1. Wall plug, 10 amp., wholesale price, 62 cents; retail, $1.12.
2. Litholite plug, 5 amp.; wholesale price, 36 cents; retail, 75 cents.
3. Wall plug, china, crocus top, 5 amp.; wholesale price, 21 cents; retail, 37 cents.
4. Wall plug, crocus, 5 amp.; wholesale price, 25 cents; retail, 62 cents.
5. Adapter (black); wholesale price, 11 cents; retail, 31 cents.
6. Key lamp holder 3½-in.; wholesale price, 29 cents; retail, 75 cents.
7. Shade carrier, cord grip, key lamp holder; wholesale, 29 cents; retail, 75 cents.
8. Twin-grip lamp holder (socket); wholesale price, 19 cents each; retail, 37 cents each.
9. Shade carrier, cord grip, keyless lamp holder; wholesale price, 19 cents; retail, 37 cents.
10. Lamp holder, ½-in.; wholesale price, 12 cents; retail, 25 cents.
11. Batten holder; wholesale price, 10 cents; retail, 25 cents.
12. Crocus adapter; wholesale price, 15 cents; retail, 31 cents.
13. Pear switch, 5 amp.; wholesale price, 37 cents each; retail, 75 cents each.
14. Bell push; wholesale price, 50 cents; retail, $1.12.
15. Bell push; wholesale price, 50 cents; retail, $1.12.
16. Bell push; wholesale price, 29 cents, retail, 62 cents.
17. Bell push; wholesale price, 31 cents; retail, 75 cents.

GROUP B.

1. Keyless socket-medium Edison; made in Germany; imported through the port of Vladivostok; manufactured by Allgemeine Elektricitäts Gesellschaft, Berlin; cost before the war about 7 cents each f.o.b. factory at Berlin; illustrates quality of sockets sold in Siberian market by German manufacturers.
2. Wall switch-snap type; used for house wiring; made in Germany; imported through the port of Vladivostok; retail price in Vladivostok in September, 1917, about 25 cents each; illustrates the popular switch in this market. It is of war-time construction.
3. Cartridge-type plug fuse; made in Denmark; imported through the port of Vladivostok.
4. Pendent switch, brass; used for house wiring; made in Germany; imported through the port of Vladivostok; typical of German goods used in this market in normal times.
5. Shade holder; used for drop-cord lights; made in Germany; imported through the port of Vladivostok; wholesale price to jobbers at Harbin, about 5 cents each in normal times. This is typical of the German fittings used in this market.
6. Snap-switch composition; used for house-wiring service; made in Japan; sold in New Zealand and Australia; price f.o.b. Kobe, Japan, 21 sen (10.5 cents) each; illustrating what Japanese manufacturers are making for competition with American goods abroad, as well as for sale in Japan home market. Many switches of this type were seen in China and Japan.





THREE GROUPS (A, B AND C) OF EUROPEAN, JAPANESE AND CHINESE ELECTRICAL GOODS ON SALE IN AUSTRALIA AND THE ORIENT

7. Snap switch, metal-covered; used for house wiring; made in Japan; sold in New Zealand and Australia; price f.o.b. Kobe 20 sen (10 cents) each; illustrating what Japanese manufacturers are making for competition with American goods abroad, as well as for sale in Japan's home market. Many snap switches of Japanese manufacture operate badly even when new.

8. Bell push; used for house and office electric bell work; made in a small shop in Japan; retail price at Kobe, 25 sen (12.5 cents) apiece; selected to show what Japanese are making in the line of electrical goods. This bell push is made up similar to British types seen in New Zealand and Australia and is being sold in those markets to an increasing extent.

9 and 10. Lamp holders with bayonet sockets; oxidized-copper finish; made in Osaka, Japan; sold in New Zealand and Australia; cost f.o.b. Kobe, 9 cents each.

11. Bell push, pendent type; used for house and office bell systems; made in a small shop in Osaka, Japan; retail price in Kobe, 40 sen (20 cents) each. This is typical of electrical goods of foreign origin as to design that are now being made in Japan.

12. Round-head electric torch, made in Japan and sold in China; price for torch complete (wholesale), c.i.f. Hongkong, 55 cents each (Mexican); retail price in Hongkong, $1.25 each.

13. Three-way plug; sold in Hongkong; made in small shop in Canton; cost $1.25 Mexican in Hongkong; illustrates what is being made in a very small way in small towns of China.

14. Attachment plug; used for extension lamps, etc.; made in a small shop in Canton, China; retails in Hongkong for 25 cents each (Mexican); illustrates what small shops in China are beginning to turn out in a small way.

15. Pendent switch; used for individual ceiling lamp control; made in a small shop in Canton, China; retail price in Hongkong, $1.25 each (Mexican); sample of switch made in small native Chinese shop; copy of British switch much in use. Shell is made of horn; work mostly done with primitive hand tools.

16. One large-head electric torch; made in Japan and sold in China; retail price in Hongkong, $1.25 each (Mexican) for torch complete; typical class of electrical supplies which Japan is now furnishing the market. Battery for this lamp (Japanese-made) costs 16 cents (Mexican) and retails at 25 cents.

GROUP C.

1. Iron-clad cut-out, 6 amp., sold in New Zealand; wholesale price, 62 cents; retail, $1.12.

2. Dry cell; used for house bells, telephones, etc.; manufactured in Japan; retail price at Kobe in November, 1917, 65 sen (32.5 cents) each. This is the average grade of Japanese cells such as are being exported to China.

3. Dry battery; used for house bells, telephones, etc.; made in Tokyo, Japan; retail price in Kobe, 1.30 yen (65 cents) each. This is a Japanese cell that is being exported to China, New Zealand and Australia. It is recognized as being the best cell made in Japan.

4. Iron-clad switch, 12 amp.; manufactured in England; sold in New Zealand; wholesale price in November, 1916, $1.75; retail price, $4.25.

5. Electric iron; manufactured in a small shop in Kyoto, Japan; wholesale price at Kobe, Japan, in November, 1917, 4.5 yen ($2.25); retail price, 7 yen ($3.50); packed for local sale in a cheap box made of corrugated paper; typical of the Japanese-made heating appliances.

6. Electric flatiron; made in Germany and sold through the port of Vladivostok; price f.o.b. Berlin factory, 16 marks each with 45 per cent discount. This is the iron which seems to have the largest sale in Vladivostok.

7. Electric bell, midget size; claimed to be of Japanese make, but it is believed to have been made in Germany; retail pre-war price at Vladivostok, 35 cents each. This is typical of this class of goods used in Vladivostok.

8. Electric teapot, made in a small shop in Kyoto, Japan; local retail price, 5 yen ($2.50) each, complete with cord. This teapot is of typical Japanese manufacture. The Japanese are beginning to make heating appliances in a small way. These appear to be made mainly by small shops and sold through a selling agent, the manufacturer often never appearing in the transaction. Appliances are cheap and have poor lasting qualities.

9. Flat electric torch, medium size; made in Japan; retail price in Hongkong, $1 each (Mexican); to illustrate a popular electric flashlight of Japanese manufacture, sold in this market. Battery renewals cost 19 cents (Mexican) c.i.f. Hongkong and retail there at 25 cents each.

10. Electric bell; manufactured in England; sold in New Zealand; wholesale price, 75 cents each; retail, $1.62.

11. Electric bell; claimed to be of Japanese manufacture, but it is much better made than the average product; retail price in Kobe, Japan, 1.30 yen (65 cents).

12. Ampere-hour meter; used for residence work; made in Germany. This was the only German meter obtainable and was obtained mainly to illustrate German meter work in the Siberian market, rather than to illustrate a piece of equipment in demand.

13. Electric fan, 8-in. standard; made in Germany; wholesale price in Vladivostok, $9 each (pre-war).

TREND IN DIRECTION OF VOLTAGE STANDARDIZATION CONTINUES

Advance of 12 per Cent in Number of Stations Operating at 110 Volts, 115 Volts or 120 Volts Has Been Made in Three Years

Data collected by the National Lamp Works of the General Electric Company, Cleveland, show that while only 60 per cent of the central stations in the United States were operating at standard voltages in 1916, at the present time 72.4 per cent are serving energy at standard potentials. The voltages considered standard are 110, 115 and 120. The change is due in a large measure to the efforts of lamp manufacturers, who now find it possible to produce lamps the voltage of which can be determined in advance of completion, whereas such procedure was impossible before the advent of the tungsten-filament lamp.

Data on the increases by states are given in the accompanying table. The figures for 1918 represent replies from 11,000 "stations." The term "stations" in this instance means not only generating stations but also communities served by transmission lines. The figures given in the columns headed "Population" give the percentage of population reached by electric service which is served at a standard voltage. In the figures for the whole United States the trend, both as regards percentage of stations and percentage of population, has been continually upward. There are a few instances in which certain states appear to be backsliding. So many factors enter into these cases that they are difficult to analyze accurately. Nevertheless, it is interesting to point out that a change to standard voltage by a large number of small stations may produce a marked increase in the percentage of stations on standard potentials without materially affecting the percentage of population receiving standard voltages. The reverse is, of course, true in the case of a large station.

State	Percentage of Stations			Percentage of Population Served by Them		
	1916	1917	1918	1916	1917	1918
Alabama	73	70.8	83.6	42	81.1	63.2
Arizona	67	96.3	93.2	75	94.1	91.6
Arkansas	77	70.1	77.5	76	68.5	79.5
California	69	59.8	72.1	73	59.7	65.5
Colorado	53	47.8	57.4	85	51.6	62.7
Connecticut	58	53.4	57.7	66	55.3	56.6
Delaware	80	83.3	92.9	97	97.6	97.7
District of Columbia	100	100.0	100.0	100	100.0	100.0
Florida	67	67.7	75.0	34	39.6	65.0
Georgia	50	56.8	70.3	58	66.7	70.4
Idaho	90	57.6	60.6	84	42.4	42.5
Illinois	83	82.4	88.4	91	84.6	92.9
Indiana	62	42.2	77.5	36	64.9	63.0
Iowa	69	65.4	87.1	73	85.2	86.5
Kansas	75	74.5	68.5	84	68.8	72.8
Kentucky	59	62.0	58.6	26	66.0	69.0
Louisiana	50	58.3	65.3	15	21.3	28.3
Maine	61	71.8	78.0	59	74.8	81.0
Maryland	39	51.5	56.0	2	9.4	12.0
Massachusetts	48	68.6	53.5	42	41.3	65.0
Michigan	52	60.0	83.4	55	72.3	86.0
Minnesota	59	59.6	80.0	43	79.9	91.0
Mississippi	56	55.3	65.7	56	62.9	69.0
Missouri	64	65.0	81.5	20	67.8	70.5
Montana	61	56.8	62.8	54	60.9	52.1
Nebraska	62	76.6	82.1	38	89.6	85.8
Nevada	83	67.8	64.7	78	93.6	93.0
New Hampshire	47	44.7	55.1	27	23.8	48.0
New Jersey	42	51.9	48.6	44	56.4	55.9
New Mexico	62	45.0	69.6	49	41.0	59.2
New York	54	51.9	69.0	50	65.9	61.7
North Carolina	63	59.5	68.0	34	65.4	76.2
North Dakota	69	66.2	69.3	73	76.6	64.8
Ohio	57	77.6	81.8	65	73.3	75.6
Oklahoma	66	74.3	80.3	42	80.0	79.2
Oregon	54	62.0	61.3	20	52.4	51.7
Pennsylvania	58	51.6	52.2	61	40.4	45.6
Rhode Island	14	56.2	52.8	10	10.0	29.2
South Carolina	71	71.5	72.8	66	80.4	87.7
South Dakota	70	72.0	74.5	69	67.5	76.5
Tennessee	63	71.8	74.3	41	55.1	57.6
Texas	77	74.7	72.1	59	77.3	96.0
Utah	30	76.3	80.6	24	45.1	48.1
Vermont	53	74.2	64.0	65	69.9	67.8
Virginia	74	65.2	65.5	76	71.3	66.3
Washington	45	45.4	65.4	17	53.8	73.1
West Virginia	77	56.2	66.3	52	66.2	79.8
Wisconsin	54	63.0	77.5	29	64.3	57.2
Wyoming	58	67.9	50.0	51	54.8	53.1
United States	60.6	69.3	72.4	53.4	62.0	67.0

EXPERIENCE SHOWS TRADE ACCEPTANCES SUCCESSFUL

Jobbers Apply Them with Resultant Reduction in Average Time Customers Take in Payment of Bills

Among the credit men of electrical jobbers and manufacturers who met the Electrical Credit Association in Chicago on Nov. 21 a definite opinion, based on experience with trade acceptances, was handed down. Those who have adopted acceptances have, of course, experienced some difficulty in details, but it seems to be the general impression that the use of the trade acceptance in the case of the slow-paying customer is an excellent proposition. Those who formerly paid in 90 and 120 days have been brought into line, so that now the average time of payment taken by customers who do not take cash discounts has been reduced about thirty days. Fifty-five to sixty days was the average time mentioned for accounts, excluding those which take cash discount. Some of the delegates who have instituted the trade-acceptance idea with slow-pay customers are planning to apply it to all classes of customers as soon as they have succeeded in educating the more troublesome among their clientele.

If acceptances are to be used to any great extent in the future, the opportunity of the present time must be grasped. It is very much easier to put such policies into effect in a sellers' market than it is in a buyers' market. Besides, it is just possible that some manufacturers and jobbers might remember any difficulties they had last year in getting cash to pay taxes.

METAL MARKET SITUATION

Market Continues to Be Dull—Stocks of Copper and Tin Are Developing

The dullness in metals that followed the signing of the armistice still continues. Prices that were not controlled are holding up remarkably well. Copper producers are pledged to continue at maximum production. Already there is a large supply of raw copper, and more is accumulating, although there is very little refined copper available. Considerable quantities of the refined metal, however, can be expected shortly.

Large quantities of tin have been found to exist in this country, which is very surprising in view of earlier reports. It is announced that the provisions of the international tin agreement will continue in effect until the 80,000 tons of tin allocated to the United States has been liquidated. The agreement, as between the contracting nations, will terminate with the signing of the treaty of peace.

Old metals continue weak. Prices are gradually lowering, and there appears to be no consumer buying to speak of.

NEW YORK METAL MARKET PRICES

	Nov. 19	Nov. 25
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	28.75	28.75
Lead, trust price	7.75	8.05
Antimony	7.75	8.75
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.00
Spelter, spot	8.50	8.70 to 8.80
Tin	No quotations	71.00
Aluminum, 98 to 99 per cent	Govt. price 33.10	Govt. price 33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	22.00 to 22.50	21.00 to 21.50
Brass, heavy	12.00 to 12.50	11.50 to 12.00
Brass, light	10.00 to 10.50	9.00 to 9.50
Lead, heavy	6.75 to 7.00	6.00 to 6.50
Zinc, old scrap	5.75 to 6.00	5.75 to 6.00

THE WEEK
IN TRADE

NEW business in the electrical line is, generally speaking, at a standstill. There is a good demand for socket devices and lamps, and jobbers are cautiously rounding out their stocks by filling the low bins. There is also some purchasing for maintenance. A number of large cancellations are reported for the week, but there seems to be a disposition not to cancel operations where raw material is actually in the process of manufacture.

There seems some reason to believe this week that cancellations will not flood the second-hand market with used equipment. It looks rather as though the manufacturers would reclaim the equipment, rebuild it and release it in such a way as not to upset the market.

Labor appears to be a bit restless, and it would not be surprising to see more or less Mooney sympathy disturbance. The socialists are making attempts, so far ineffectual, to upset things. In fact, labor presents the most serious problem of reconstruction, and those looking for lower wages very soon, according to present indications, are likely to be disappointed.

Prices of equipment are keeping very steady. Large stocks, ordered long before the armistice was signed, are on the way, however, and it consequently would not be surprising to see the market give way a little here and there as competitive conditions arise.

NEW YORK

With the exception of socket devices, the local market has been rather quiet the past week. There have been some inquiries, but no orders of any consequence are reported. Government contracts are still being canceled, and manufacturers are beginning to put their plants in order for peace business. The general practice seems to be to permit the manufacturers to finish those goods in the process of fabrication.

Industrial labor is getting more plentiful, but there are still reports of shortage.

Prices are holding very strong with no indications of any break. Local stocks are in good condition and are rounding out in those places where they were spotty. Orders, however, are not being placed so far in advance. The jobbers are marking time and will shortly be in a position to take care of any building that might arise.

Large quantities of projected building are reported, and architects appear to be getting very busy. There are grave doubts, however, that this will reach any considerable volume while prices of material and money remain so high. At any rate, it is very doubtful if the electrical interests will feel the effects in any volume of a large building program much before the first of May or June

CONDUIT.—Large shipments are on the way, and local stock will shortly be in a very excellent position

WIRE.—Manufacturers may finish all outpost wire that has been stranded according to the latest reports. Good stocks of code wire are reported.

LAMPS.—Demand is good and getting better, and stocks are in good condition.

MOTORS.—There seem to be a few motors available, although an inquiry for a 200-kw. motor showed that six months was the best delivery date.

APPLIANCES.—There are a few flatirons in stock. Radiator stocks are short with increasing demand. A limited stock of copper washing machines is reported. Demand generally is getting better and better with the approaching holiday season.

CHICAGO

The past week showed very little change over the one just preceding. The jobbers report that there are many orders but they are small. Cancellations which have been received all come from concerns which have not yet started production, and no cancellations have been received from firms which are operating on contracts already started. There have been no changes in prices.

The news concerning construction activities ready for starting is not quite so favorable this week as it was last. While several specific instances in which projects are ready for launching have been mentioned in the papers, there was also mention of cancellation of construction at some of the government camps. On the whole, however, the building outlook appears to be bright.

In thinking about reconstruction, manufacturers are also arriving at the conclusion that the small manufacturer who has correct designs—that is, designs in which no excess material is used—and who knows his cost and operates on a definite policy will find opportunities for considerable development. The subject of export trade also occupies a prominent position in the minds of the manufacturers.

Credits and collections are reported to be in an excellent condition. The belief is expressed, however, that the credit of the electrical contractors should be watched carefully during the coming building boom.

COPPER WIRE.—There was no change in the copper-wire market during the last week. Not enough wire is in the country at the present time to permit the market to sag, even though the demand should drop to practically nothing.

TRANSFORMERS.—Some of the manufacturers see the possibility that the central stations will attempt to get out from under some of their financial burden by requiring customers to purchase all utilization apparatus, including transformers. Even if this is true it seems unlikely that the change will mean much to the trade, since the central stations will in all probability devise some method of retaining supervisory control over the purchase of transformers in order that inferior apparatus may be kept off their lines.

DIESEL ENGINES.—During the war practically all manufacturers of Diesel and oil engines have been occupied in constructing submarine equipment. These manufacturers are now getting ready to launch a selling campaign among the central stations and among the industrial plants and mines that use prime movers of moderate size.

METERS.—There is considerable activity in the export field among the meter manufacturers.

FIXTURES.—Fixture manufacturers see a period of eight or nine months for them between the cessation of government work and the beginning of private building. Some of the naturally optimistic thinkers, however, have pointed out that the fixture business is to a large extent a replacement proposition and that the shelves of the contractor-dealers in the country have been practically cleaned of fixtures during the war period. This replacement business can be secured now since the ban has been lifted from the sales of metal goods. Moreover, the contractor-dealers will welcome an opportunity to replenish their stocks, since during the past few months they have been limited in their sales efforts, through lack of stock, to such an extent that they have been repairing and refinishing old fixtures already owned by customers.

MOTORS.—Concerns already in the business are thinking seriously of the export trade and of adding more sizes to the lines which they are already producing.

METAL CONDUIT.—The suggestion has been made in the trade that prices of steel tubing may go up when the government's price regulation of steel is discontinued. The statement to this effect is based on the fact that previous to the armistice date there was not enough steel tubing being produced for the government's own use, yet even with that condition prevailing, production was ordered reduced 40 per cent. There is a considerable shortage in butt-welded pipe, which leads some observers to believe that conduit prices may rise.

BOSTON

Jobbers are extremely busy despite a cautious policy now apparent in many branches of commerce and industry. Optimism regarding the future was expressed by a large number of jobbers, contractor-dealers and central-station men interviewed toward the end of last week. Stocks are low along the line of industrial supplies, but the removal of priority restrictions has put a better face on deliveries, and jobbers are already ordering supplies for receipt early in the new year. So far prices are holding firmly.

The labor situation presents the most serious problem at this time. Cancellations of war orders are being received here and there, and overtime work has been largely eliminated. War orders upon which work has not been done have been canceled in many localities; in others the government has notified the manufacturers to suspend production as soon as goods in process are completed. At this writing there has been no wholesale cutting of war orders sufficiently large to flood the market with unemployed labor, although the employment agencies and factory and central-station superintendents report an increasing number of applicants for steady work.

Architects are beginning to receive requests from clients to prepare plans and specifications for new building work, despite the fact that high prices of labor and material and the high cost of money are retarding immediate expansion in this field on a large scale. It is expected that a large amount of new construction will be under way within a few months and that the exhausted shelves of retail dealers in many branches of trade will soon be the cause of great activity in manufacturing circles.

Central stations report little reduction in load as yet, though the doing away with night work and overtime is unquestionably cutting into the twenty-four-hour output somewhat, perhaps 10 per cent at the outside. There is a general feeling among the more conservative jobbers that if stocks are maintained and customers served without resorting to price-cutting through fear of future price declines, conditions will be better in the next few months than if attempts are made to obtain speculative profits in the present transition period.

CONDUIT.—Delivery promises are encouraging, though as yet shipments of pipe are slow to materialize. By the time the building trade gets on its feet, however, stocks should be greatly enlarged in comparison with the present general scarcity.

WASHING MACHINES.—A most promising market is reported, supported by excellent sales. One of the smaller jobbers sold seventeen machines in a fortnight.

LAMPS.—A big trade in lamps is in sight, following the removal of lighting restrictions by the Fuel Administration. Retailers report increased sales of portable lamps within the past two weeks. Free renewals have been resumed in some central stations in the larger units.

FIRE-ALARM EQUIPMENT.—Conditions are quiet in municipal circles, but industrial plant improvements are likely to call for new equipment soon. Plans are afoot for a more competitive development of the municipal field by manufacturing interests hitherto specializing in interior apparatus.

MOTORS.—The supply of motors is still spotty. A large amount of betterment work in electric drives is in sight. Underloaded machines are to be taken in hand, with much benefit to the motor and controller market.

FARM-LIGHTING EQUIPMENT.—Sales have been held back by the difficulties of battery delivery, but the prospects are good for next spring.

RADIATORS.—An improvement in supply is noted. The demand is excellent, one moderately small dealer disposing of fifty units in one day recently. Mild weather has helped in the accumulation, but stocks would soon be seriously depleted if a prolonged cold snap should come.

FIXTURES.—Business is still very dull, but the improved outlook in the building trade reflects encouragement. Some contractor-dealers are going out of the fixture business on account of the high overhead entailed. Specialty houses, however, are well stocked.

ATLANTA

A spirit of optimism pervades the electrical field in the Southeast. Opinions vary regarding the outlook for the following six months, but every one is of the same mind relative to business for 1919, namely, that trade in all lines is going to be active. It is reported that some large distributers are laying plans now to order reasonable stocks of rubber-covered wire and standard material so that they will be in good shape to take care of the much-needed replacements, and also anticipating a heavy demand from commercial channels which will open up in the early spring from work that will be started around the first of the year. Architects have had stacks of plans laid away that are now being brought out and revised to meet the present conditions of readjustment. Although there is no surface indication of a building rush at this time, there is an undercurrent of activity pointing to the fact that this section is rapidly absorbing the peace news and getting ready for the large volume of ordinary commercial business that is bound to be transacted. The news from Washington that the ban on all building is off, together with the appeal to municipalities from the War Industries Board to go ahead with construction will certainly be gladly received here. Construction of this nature has been stagnant so long that a reaction is sure to follow. The lifting of the cotton embargo is reflected in the more cheerful expressions of contractors and dealers at outlying points.

Uncertainty still exists regarding the future of Southeastern cantonments, but information reported to have been given out by a personage high in Washington military circles indicates that all camps will be abandoned with the exception of Camp Gordon, Atlanta, Ga., Fort Oglethorpe, Ga., and Camp Jackson, Columbia, S. C. These possess excellent facilities of distribution as well as strategic value. It is reported that barracks at Camp Benning, Columbus, Ga., are to be constructed of tile instead of wood, which indicates that this will be a permanent camp.

APPARATUS.—Manufacturers are notifying their customers that the lid is off and no priority affidavits are necessary to secure turbines, generators, motors, etc. The last two weeks have shown a decline in inquiries and orders for large equipment.

CONDUIT.—Restrictions have been modified on rigid conduit, and this class of material can be purchased without accompanying priority classifications. Government orders are to receive preference, as usual. The government is curtailing purchases, and if a wholesale cancellation of outstanding orders takes place, shipments of conduit will be somewhat improved. While the demand for conduit is comparatively quiet at this time, it is expected that commercial activity will offset the lack of government orders.

SEATTLE—PORTLAND

To a large extent the industrial field seems to be marking time and drifting into the reconstruction period in a very gradual manner. There have, however, been a few important changes within the past week or ten days. All work being conducted by the spruce division has been held up and all contracts for equipment not already on the way canceled. This has affected in a marked manner a number of industries, particularly in the Portland district, where one large manufacturing company laid off its entire night shift of approximately 1200 men, owing to canceled orders. The various shipyards, however, both steel and wooden, have work contracted for a long time to come. The reported noticeable slowing down in orders received from shipyards applies strictly to the Portland field, as Seattle electrical jobbers report for the week that business was as good as or better than for the past several weeks.

Sales volumes, particularly in retail trade, are increasing rapidly at the approach of Christmas. Jobbers and contractors in Portland report little if any change, although there seems to be a general feeling that there is a tendency to slow down a bit.

Electrical manufacturers first cut their stock requirements from a six-month period to four months, and since in some lines to an even shorter period. Many Portland electrical contractors have released men during the last few days, and it is a noticeable fact that laborers are now obtained for electrical work with relatively no trouble, whereas a few weeks ago it was almost impossible to supply the demand. Portland jobbers report stocks in good shape in practically all lines. At the present time no special movement of any line is noticeable. In the appliance end there is undoubtedly a decided depression, due not to the probable period of peace but to the very material increase in price effective last week. This depression is felt also in Seattle.

The lifting of the embargo against shipments of northwest forests products into the territory east of the Mississippi and north of the Ohio River has been gratefully received by local lumbermen. In Seattle there is a noticeable increase in the announcements of new building projects. All important problems connected with large wooden-ship construction apparently have been solved, and nothing now stands in the way. However, the Northwest is faced with a labor shortage estimated at about 14,000 men, embracing all branches of labor. Steel shipyards of Seattle and Tacoma are confronted with a situation that threatens to curtail production materially. The release of men from Northwest spruce camps is expected to help somewhat as will the expected demobilization of men in nearby cantonments. Seattle jobbers as a whole report collections exceptionally good.

SAN FRANCISCO

The Pacific Coast electrical industry has not yet been affected by the signing of the peace armistice. Rather has it prepared itself for a triple load—the continuance, for the present at least, of special war work, the resumption of interrupted non-essential work, and preparations for what is supposed to be the heaviest electrical Christmas yet.

The forthcoming meeting of the northern California cooperative campaign, following hard on the heels of the southern California meeting, will coalesce the electrical contractors for the enormous private construction and the business to come.

Early rains have encouraged the power companies, although the mountains have not been drenched so heavily as has the coast. In the San Francisco Bay district the present rainfall is about 300 per cent greater than the average rainfall at this time of the year. This will at least relieve the irrigation problem and will release energy for other needed work.

The Sierra & San Francisco Power Company has been granted permission to raise its rates by about 15 per cent.

The labor situation is again threatening, the past week having been marked by sporadic strikes in the shipyards.

HEATING DEVICES.—Some deliveries of electrical radiators are now being made. As to percolators and other special heating devices of Christmas nature, some fortunate firms have received their advance orders already, while others are afraid that their stocks will reach them too late.

SCHEDULE MATERIAL.—The first indication of peace and its effect upon shipyard business was the cancellation of several orders for marine schedule material, principally composed of door switches to cut off light instantaneously on the opening of outside doors on the ships. These switches prevented any disclosure of a ship's position to submarines. Most of the orders had already been shipped, so that this cancellation did not affect many items.

FARM PLANTS.—The farm-plant business has shown great increases during the past month, probably due to a circulation of crop money and the result of the summer campaign by representatives of several of the factories. This business is rather surprising in its extent in a state so well covered by power lines as is California. Deliveries, which have been hampered for some time by inability to get storage batteries, are now much better. Several wide-awake dealers are carrying stocks at certain districts and not depending upon factory or San Francisco or Los Angeles shipments.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+30% to $73.20
Coil to 1000 ft	List
	No. 12 Solid
Less than coil	+30% to $85.20
Coil to 1000 ft	List

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00
Coil to 1000 ft	100.00
	No. 12 Solid
Less than coil	+20% to $162.00
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 12%
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
12 to 50	40	40— 41
50 to barrel	35— 36	36— 37
Barrel lots	32— 329	33— 339

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40 to $0.45	$0.40 to $0.45
12 to 50	.35 to .39	.35 to .39
50 to barrel	.319 to .362	.329 to .382
Barrel lots	.289 to .332	.299 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
1	50	13.00
1¼	50	21.00
1½	50	26.00
2	25–50	35.00
2½	25–50	45.00
	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single trip	$75.00	$63.75— 69.75
½-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00	85.00— 93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.25 to $63.75
½-in. double strip	78.25 to $90.00	71.25 to 75.00
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00 to 120.00	93.00 to 100.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
7/32	$0.05½	1	$0.25
⅜	.06	1¼	.33
½	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$25.00–51.70	$24.60–35.20	$23.00–30.25
½-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$44.00–60.00	$30.00–33.00	$26.50–29.15
½-in.—	48.00–65.00	33.50–36.00	29.00–31.80

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	.08½
⅜	.08½
½	.11½
¾	.17
1	.23
1¼	.27½
1½	.37½
2	58½
2½	76½
3	

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.19
¼	.06	.19
⅜	.07	.19
½	.10	.25
¾	.13	.37
1	.17	.45
1¼	.21	.50
1½	.28	1.10
2	.40	1.80
2½	.60	4.80
3		

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 7.1%	9% to 9.1%
2500 to 5000 lb.	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb.	+5.5% to 3.5%	+3.5% to +1.5%
2500 to 5000 lb.	+2.5% to +0.5%	+5% to 1.5%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.00 to $7.00
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	41% to 45%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$6.00 to $9.37
1/5 to std. pkg.	5.25 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$8.00
1/5 to std. pkg.	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.6[illegible]
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg	List
Std. pkg	10%

DISCOUNT—CHICAGO

Less than std. pkg	List
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.47—$40.77
Coil to 1000 ft	27.42— 30.22

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$23.93 to $30.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%	10%
$10.00 to $50.00 list	30%	20%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	5%
1/5 to std. pkg	15%
Std. pkg	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$21.00 to $34.00
1/5 to std. pkg	17.85 to 28.90

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$21.00–24.15
1/5 to std. pkg	17.85–21.00

Standard package, 2200. List per 1000, $20.00–21.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$16.00 to $22.00	$32.00
1/5 to std. pkg	13.60 to 18.70	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$13.00–$18.40	$32.00–$36.80
[illegible] std. pkg	11.50– 16.00	27.20– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List
1/5 std. pkg	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T	$0.80
60-amp. S. P. S. T	1.20
100-amp. S. P. S. T	2.25
200-amp. S. P. S. T	3.48
300-amp. S. P. S. T	5.34
30-amp. D. P. S. T	1.20
60-amp. D. P. S. T	1.78
100-amp. D. P. S. T	3.38
200-amp. D. P. S. T	5.20
300-amp. D. P. S. T	8.00
30-amp. 3 P. S. T	1.80
60-amp. 3 P. S. T	2.68
100-amp. 3 P. S. T	5.08
200-amp. 3 P. S. T	7.80
300-amp. 3 P. S. T	12.00
Low Grade:	
30-amp. S. P. S. T	$0.42
60-amp. S. P. S. T	.74
100-amp. S. P. S. T	1.50
200-amp. S. P. S. T	2.70
30-amp. D. P. S. T	.68
60-amp. D. P. S. T	1.22
100-amp. D. P. S. T	2.50
200-amp. D. P. S. T	4.50
30-amp. 3 P. S. T	1.02
60-amp. 3 P. S. T	1.84
100-amp. 3 P. S. T	3.76
200-amp. 3 P. S. T	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	+10% to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	List to 8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+ 15%
$10 to $25 list	List to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15% to 16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Sna Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List to 10%
1/5 to std. pkg	10% to 16⅔%
Std. pkg	18% to 25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 30%	Net
$2.00 to $10.00 list	10% to 35%	5%
$10.00 to $50.00 list	20% to 37%	10%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to 6.50
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.54–$0.66
No. 18, full spools	.52– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.71
No. 18, full spools	.55 to .595

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$20.00–$25.00	$15.00–$17.00	$15.00–$15.75
12	23.58– 27.09	21.62– 29.09	17.68– 23.22
10	30.20– 37.80	27.45– 32.40	23.47– 32.40
8	42.74– 53.34	38.85– 45.72	33.21– 45.72
6	61.50– 84.42	55.35– 72.36	52.58– 55.48

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$25.00	$18.00–$25.00	$15.50
12	$29.46– 31.44	29.46– 31.44	$25.54– 31.44
10	41.10– 43.84	41.10– 43.84	34.62– 38.36
8	57.00– 61.76	57.00– 61.76	50.18– 54.04
6	85.31– 97.68	85.31– 85.47	77.21– 85.47

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$39.75 to $44.00
25 to 50 lb	39.75 to 42.00
50 to 100 lb	38.75 to 40.00

CHICAGO

	Per 100 Lb. Net
Less than 25 lb	$41.00 to $41.76
25 to 50 lb	39.75 to 40.76
50 to 100 lb	38.75 to 39.76

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Portable Twin-Arc Lamp

The Allison & Hadaway Corporation of 42 West Thirty-ninth Street, New York City, has just developed the "Panchroma" self-contained twin-arc

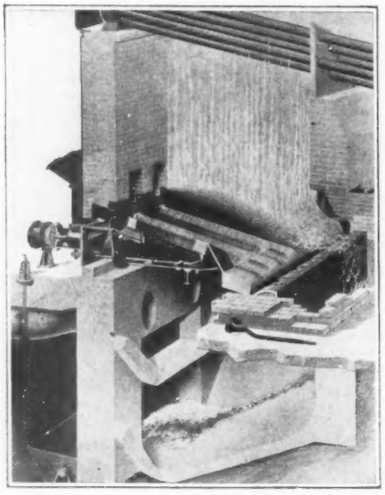
MAY BE USED IN MOTION-PICTURE AND PHOTOGRAPHIC STUDIOS

lamp for motion-picture studios, photographers and photo-engravers. It is designed to give a powerfully actinic light. When the lamp is not in use the doors, which act as reflectors, may be folded together and the folding stand dismounted in this way, permitting the new model to be carried about, as it weighs but 18½ lb. (8 kg.). The manufacturers point out the feature that there are no projecting parts to break off or to catch the clothing and that mislaying parts is not possible since nothing but the stand need be detached.

The 12-in. (30-cm.) carbons in the lamp are said to require infrequent trimming, the lamp giving a good white light with little flickering. Prominent double shadows are obviated by a triangular shadow breaker that is placed between the arcs. Adjustment of the rays is facilitated by both the reflectors and the tilting mount, so that the light may be distributed in any range from one strong beam to an area of 120 deg.

Automatic-Cleaning Underfeed Stoker

An automatic-cleaning underfeed stoker has been developed by the Under-Feed Stoker Company of America and is similar in general design to the standard Jones underfeed stoker but in addition has the self-cleaning feature. Coal is fed into the hoppers in front, either by gravity from storage above or by hand. The steam cylinder below and in front of the hopper operates a pusher rod and ram which as it moves toward the fire pushes a charge of fresh coal from the hopper into the retort or coal magazine that supports the fuel bed. As this coal is pushed into the retort it moves the previous charge of coal slightly backward and upward. This intermittent process keeps fresh coal fed into the fuel bed from below. As this coal is gradually forced upward, the heat from the incandescent zone above drives the volatile gases from the fresh coal before the actual burning takes place. These gases mix with the air admitted through the tuyères, and the mixture passes upward through the hot fuel



DESIGNED SO FUEL AT REAR IS COMPLETELY BURNED

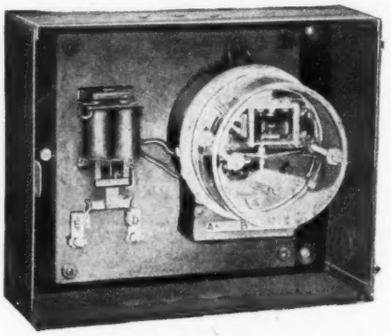
above. The gasless coal or coke which is left is forced to the upper part of the fuel bed (the incandescent zone) by the new fuel coming in, where it burns with the gas coming up from below. This process gives a coke and gas fire, not a coal fire.

As the coke burns, the intermittent movement of the fuel, caused by the feeding of fresh coal from below, moves the whole burning fuel bed with ash and refuse slowly toward the rear. This is not a gravity movement, as the slope of the retorts is not sufficient to cause the ash and refuse to slide or roll toward the dump plate. The movement is primarily caused by the intermittent upward and backward motion of the fuel resulting from the steam-ram action. This backward movement, assisted by the pusher rod and blocks, carries the whole fuel bed slowly toward the rear as though on a conveyor, so that when the fuel bed reaches the dump plate at the rear the coal is burned. This keeps the fire clean and prevents the "avalanching" of burning fuel onto the dump plate. As the refuse accumulates on the balanced dump plate at the rear of the furnace, the plate is dropped, which dumps the ashes into the ash pit below. This need be done only at infrequent intervals and is the only manual operation necessary as the cleaning is automatic. This automatic cleaning feature is said to effect a very important saving in labor.

Protection of Polyphase Motors

Protection of polyphase motors operating elevators or cranes against reversal of one phase or open circuit in one wire may be secured by the use of Palmer type TS reverse-phase relays, which, according to the maker, give full protection against reverse-direction elevator accidents or motor burn-outs due to attempted single-phase operation. This device is particularly applicable to elevator controllers in which a no-voltage opening-shunt-coil contactor, in the circuit between the reversing switch and the motor, forms a standard part of the elevator equipment. The action of the relay under reverse-phase or single-phase conditions opens the magnet circuit of this contactor so that it will not connect the motor to the line unless proper operating conditions prevail.

The device is selective, the manufacturers say, in its single-phase operation to the extent that if a fuse blows when



ECONOMICAL RELAY FOR ELEVATORS OR CRANES

the car is moving the motor carries the car to its next stop and prevents the motor from being again connected to the line until properly fused.

This device is made by the Palmer

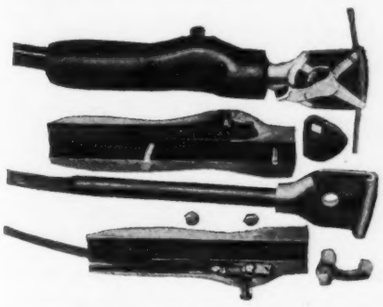
Electric Manufacturing Company, South Boston, Mass.

It is said that the relay is a simple device to install and connect, either in old or in new motor installations, but that the wiring connection must be exactly in accordance with diagrams and instructions furnished by the company. Elevator and crane motors equipped with this type of relay comply with the National Code regulations that call for the protection of this class of apparatus against possible operation under reverse or single-phase conditions. According to the manufacturers, the relay is very economical, requiring only 3.85 watts, and, as its moving parts stand on jewel bearings and are of standard watt-hour-meter construction, it can be depended upon for long service under normal conditions of use.

Strong Light-Weight Holder for Arc Welding

In electric arc welding it is not only desirable to have an electrode holder strong enough to hold the electrode during operation but also one which can pull the electrode away should it stick to the work. Again, with the increase of women as welding operators it is advisable to have a tool which is neither very heavy nor cumbersome. With these ends in view the Arc Welding Machine Company, Inc., of 220 West Forty-second Street, New York City, has developed a new type of electrode holder especially designed for a closed-circuit system but also applicable to other systems.

Welding current enters the holder through the rear end of an insulated composition shank and passes along to the head of the tool and from there directly into the electrode. Excessive heating due to contact resistance is said to be impossible, there being no joints in the holder save where the cable is soldered into the shank. Since there is a relatively large contact between the holding head and the electrode, undue heating at this point is also precluded. The actual holding device consists of a lever-controlled spiral segment of case-hardened steel which



READY FOR USE AND ASSEMBLED TO SHOW VARIOUS PARTS

grips the electrode harder as it is pulled, so that the electrode will not come out should "freezing" to the work take place. Yet the electrode can be quickly and easily removed from the holder by the lever when changing is desired. For remote control with the closed-circuit system a trigger in the shank is used which is omitted on holders for other systems.

Economical 75-Watt Argon Lamp

A 75-watt argon-filled lamp which is said to be a real coal saver has been perfected by the Hygrade Lamp Company of Salem, Mass. This lamp, filled with argon instead of nitrogen, has an average life of 1000 hours, the same as other lamps, and the manufacturers claim excellent character of light and economy of operation.

Aside from its much more frequent use in offices, stores, store windows, mills, factories and other large spaces, this 75-watt argon-filled lamp will be especially useful in home lighting. It is said to have a spherical candlepower of 69 and can be used in place of any cluster of tungsten-vacuum lamps of approximately the same candlepower at a considerable saving of electrical energy. For instance, at a cost of 10 cents per kilowatt-hour a 75-watt argon-filled lamp will burn 1000 hours for $7.50. For the same length of time one 40-watt vacuum lamp, with a total spherical candlepower of 68 and a total consumption of 90 watts, will cost $9. A comparison with other combinations of vacuum lamps will give the same result in favor of the 75-watt argon-filled lamp, the makers say.

An advantage which is not shown by figures is that actually the 75-watt argon-filled lamp will give more useful light than any combination of 25-watt to 50-watt tungsten-vacuum lamps having the same rated candlepower if the light is diffused with suitable reflectors, the pear-shaped lamp with concentrated filament throwing the light where it is wanted better than the straight-sided group of filaments in the ordinary vacuum lamp.

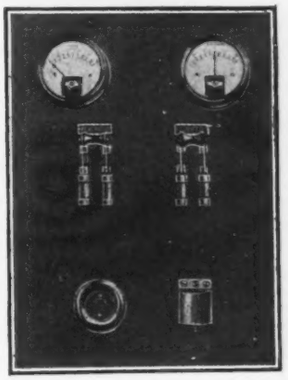
Small-Capacity Light and Power Plants

Light and power plants of ten-light and twenty-light capacity with a belt-connected engine are being marketed by the Essandee Corporation of 39 South La Salle Street, Chicago. When not charging the batteries the engine may run pumps, corn shellers, cream separators and similar labor-saving devices.

The hard-rubber jars used in the sixteen-cell storage battery are said to be sealed so that the elctrolyte cannot readily leak out. The engine, of gasoline or kerosene type, develops 1½ hp., has a speed of 500 to 600 r.p.m. and dispenses with batteries for ignition purposes, using a magneto instead. The commutators are extra large inasmuch as the generator has been designed for low-voltage service. Heavy slate is used in manufacturing the switchboard.

Switchboard Designed for Simplicity

Switchboards designed for farm-lighting, in standard sizes, measuring 18 in. by 24 in. (45 cm. by 60 cm.), and rated at 30 amp., 32 volts, are being made by the Knoeller Electric Company, De Pere, Wis. The details of



FOR USE WITH SMALL ISOLATED PLANTS

these switchboards have been worked out with the special purpose of making it almost impossible to injure the apparatus which they control. They are made of 1-in. (2.5-cm.) purple slate, mounted on angle-iron supports. They are equipped with a voltmeter, ammeter, switches and an automatic cut-out.

Film Fire Prevention

If the film in a motion-picture projector clogs and stops running in front of the arc light, it usually ignites and flares up. The reflection of the burning film projected on the screen causes the audience to become restless and apprehensive and even to stampede for the exits. Should the flames reach the magazine reels a serious fire is possible. In order to remove these two hazards the Seligraph Company of 92 Lenox Avenue, New York City, is marketing the "magnetograph," a device for attachment to any make of projector. This is said to cut the strip of burning film, seal the entrances of the two film reels, turn off the arc light and stop the motor, drop the port shutters into the booth, turn on the auditorium lights and signal the orchestra to start playing.

When the film ignites the heat burns a trigger string, releases the trigger, which breaks a magnetic contact and causes knife blades to cut off the burning film at the two points of entrance to the magazines, sealing the apertures so that the flames are prevented from spreading and are forced to burn out in the lamp house, the makers say. A pin release shuts the port shutters, through which any smoke or reflection of fire on the screen would necessarily have to pass. An automatic control and booth-service breaker is used for turning on the auditorium lights and the orchestra signal lamp and to turn off the arc light and stop the film-winding motor.

Trade Notes

LABOR DISPUTES DURING SECOND QUARTER OF 1918.—The United States Bureau of Labor Statistics reports 997 strikes and 26 lockouts in the United States during the second quarter of 1918. In 528 strikes the number affected was 287,404, and the average duration of 554 strikes reported as ended during the quarter was fourteen days.

IMPORT RESTRICTIONS ON RUBBER MODIFIED.—The War Trade Board announces in a new ruling (W. T. B. R. 355) that W. T. B. R. 248, issued Oct. 3, 1918, under which the total importations of rubber to be licensed during October, November and December, 1918, were limited to 25,000 tons, has been amended to permit the licensing of 7500 tons additional prior to Jan. 1, 1919. The amount so licensed will be allocated by the War Trade Board.

STOKER MANUFACTURERS COMBINE SALES ORGANIZATIONS.—Beginning with Jan. 1, 1919, the Sanford Riley Stoker Company of Worcester, Mass., and the Murphy Iron Works of Detroit, Mich., will combine their sales policies in one large constructive organization, it is announced, so as to render the greatest possible service to all clients. Eleven centrally located offices will handle both sales and service for the Riley underfeed stoker and the Murphy automatic furnace. These offices will be established in the following cities: Worcester, Boston, Philadelphia, New York, Pittsburgh, Buffalo, Detroit, Cleveland, Cincinnati, Chicago and St. Paul.

ENGLISH ELECTRICAL MANUFACTURER SCORES EXCESSIVE COMPETITION.—H. I. Rogers in speaking before the Western Section of the British Institution of Electrical Engineers from the standpoint of the manufacturer stated recently that perhaps the most important cause of the failure or extremely unsatisfactory state of affairs of the British electrical industry has been the excessive and unnecessary competition between different manufacturers. Electrical apparatus, it was pointed out, is inherently cheap if manufactured under right conditions. All parts should be produced on a repetitive basis, and if so quality can be of the highest and conditions of the workers can be of the best. This, however, can only be done if the purchasing public will buy the resulting apparatus. The consumer, it is held, must standardize his requirements while the manufacturer must produce apparatus which will stand the acid test of service. The best designed appliances under proper conditions of manufacture cost no more than apparatus of poor design. Under these conditions the industry, it was pointed out, would be profitable to the worker and insure good wages; it would be profitable to the manufacturer and insure financial stability, and profitable to the consumer because it would insure him machinery of good quality at a reasonable cost.

SPECIAL EXPORT LICENSE FOR SAMPLES.—The War Trade Board announces that W. T. B. R. 280 is revoked and that a special export license, effective Nov. 25, 1918, No. RAC 55, has been granted to the Post Office Department and to the Customs Service, authorizing the exportation, without individual export license, of samples of any commodity and advertising matter to be used therewith, regardless of whether the same are shipped by mail (subject, however, to the postal regulations), by express, or by freight, in passenger's bagage or otherwise, when destined to any country except Norway, Sweden, Denmark proper, Iceland, the Faroe Islands, European Holland, Switzerland and Greece. Under this license the term "samples" is construed to mean articles or portions thereof intended for use in soliciting orders and is not construed to include any article or portion thereof which is itself intended to be sold as an article of commerce. Shippers should note that it is unnecessary to apply to the War Trade Board for permission to ship under special export license RAC 55, and no special document issued by the War Trade Board is necessary in connection with such shipments. It is only necessary to note on the package, if the shipment is made through the mails, or on the export declaration, if the shipment is made by express or freight, the following: (1) "Shipped under special export license RAC 55"; (2) the name and address of shipper; (3) the name and address of consignee; (4) a statement of contents. It should further be noted that special export license No. RAC 55 is not a license to trade with the enemy and does not authorize any shipment in contravention of Section 3 of the trading with the enemy act.

CHANGES IN FAIRBANKS, MORSE & COMPANY STAFF.—Following a recent meeting of the directors of Fairbanks, Morse & Company of Chicago, with branch houses in principal cities all over the country, C. H. Morse, Jr., president, announces several new and important changes covering the active management of the business. R. H. Morse has been elected vice-president in general charge of purchasing and traffic. Mr. Morse's connection with the firm covers many years of varied experience in both sales and manufacturing departments, and he continues his duties as a director of the company. C. W. Pank rises from general director of sales to vice-president in charge of sales of all factory products. Mr. Pank's growth with Fairbanks, Morse & Company has been unusually marked since his start with the firm some thirty-three years ago as a stenographer. His activities through these many years have included practically every

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branch of sales and affiliated effort. W. S. Hovey, formerly general manager of the large Fairbanks-Morse manufacturing plant at Beloit, Wis., has been elected vice-president in charge of general manufacturing at all factories. Mr. Hovey has been with this concern for a number of years, aiding in its development through the application of modern principles of design and manufacture to many of the Fairbanks-Morse products. W. E. Miller becomes vice-president and treasurer instead of first vice-president. F. M. Boughey retires from the position of treasurer to become secretary and comptroller.

RESALE PRICE FIXING.—Declaring it has reason to believe the concerns are forcing retailers to maintain standard fixed resale prices on their products, the Federal Trade Commission, "in the interest of the public," has just issued formal complaints against the Procter & Gamble Company and the Procter & Gamble Distributing Company, Cincinnati, makers and distributers of "Ivory" soap, and the Klaxon Company, Newark, N. J., maker of automobile horns. Both concerns are charged with refusing to sell to dealers who insist on reselling to the public at prices they deem adequate. The Procter & Gamble companies were also charged with refusing to sell mixed carload lots of their products unless purchasers also buy "Ivory" soap. The Klaxon Company is further charged with selling its Klaxon horns on the condition, agreement or understanding that dealers shall at all times carry a minimum stock of Klaxons to the value of $300 and is charged under the Clayton anti-trust act with fixing prices, rebates or discounts on the condition that dealers will not deal in the products of its competitors.

SWISS MARKET FOR ELECTRICAL GOODS.—A report by Consul Philip Holland from the Basle district of Switzerland on the condition of the market for electrical material during 1917 has just been released by the Bureau of Foreign and Domestic Commerce. It says, "The demand for electrical machinery and equipment was heavy throughout the year. As the use of gas was cut to less than half of the normal need and wood and coal were scarce and dear, efforts were made in private homes and in industrial plants to replace heat and power with electricity. Raw materials, especially electrolytic copper, could not be had in sufficient quantities to meet the demand and prices rose to many times the normal. Large electrical machines could not be sold or delivered without government permits. Electrical insulations, especially high-tension insulations, were in demand. These were manufactured and sold profitably in the district and also exported to France and Italy. A new industry for manufacturing electric heaters was established and was able throughout the year to dispose of its product. This heating apparatus is constructed of composite stone, with inside wiring, and heats during the night at a low rate for energy. The industrializing of small villages has created a heavy demand for small motors. In almost every village in this district there is some kind of factory which gives employment to the inhabitants between the crop seasons."

CONDUIT CONCERN'S AMERICANIZATION PLANS.—A system of free schools to educate adult foreigners employed by the Youngstown (Ohio) Sheet & Tube Company was started as early as January, 1917. The scope of the plan, as it was designated and as it has been carried out, opened these schools to the non-English-speaking women in the households of the company's employees. The classes were held originally in a building in the heart of the section inhabited by those employees. The course consists of reading, writing, spelling, grammar and arithmetic. At the beginning six teachers were employed, and the first term began on Jan. 8 and closed the first week in June. The first session, from 8:30 to 9:30 in the morning, was intended for men working from noon until midnight; the second session, from 3 to 4 p. m., for those employed on the night turn, and the third session, from 7:30 to 9 o'clock in the evening, for men employed on the day turn. Women were admitted to all these sessions and encouraged to attend those which were most convenient. In addition to the regular sessions, special classes for instruction in citizenship, civic and kindred branches were conducted on Thursday of each week. The success which attended the entire venture the first year resulted in increasing the number of teachers to fourteen during the 1917-1918 term. Additional schools were established, and the plan was enlarged accordingly. At various times during the terms special exercises were held, including addresses, music and the presentation of certificates to pupils who had earned them by the good quality of their work.

PROCEDURE FOR EXPORTS TO MEXICO.—In view of the increasing scarcity of many commodities of prime importance and necessity to the United States and which at the same time this government desires to share with Mexico, it has become necessary for the War Trade Board to allot such commodities for export to Mexico, in order to equalize the distribution throughout the neighboring republic in an equitable and orderly manner consistent with the maximum amount of such commodities as can be spared. Prospective importers in Mexico will facilitate the granting of licenses for export by the War Trade Board by presenting copies of their orders for supplies in triplicate to the nearest American consular officer, who will visé such orders and retain one copy for his file, returning the original and one copy to the applicant. The importer should forward both visé orders to the prospective exporter in the United States, with instructions to attach the original visé order to his application to the War Trade Board for an export license covering the commodity specified in such order, or file the original visé order with the War Trade Board at Washington, D. C., and thereafter, in filing applications for licenses to export the commodities specified on such order, refer to the order by the consulate stamp serial number which will be affixed to the order, and also the consular address, as "Mazatlan, Serial No. 4782." The official statement further says that in cases where American consular officers are not easily accessible to the prospective importer, a statement to that effect should be attached to the order, giving the name of the nearest place where an officer connected with the American consular body is stationed.

A. F. DAUM, manufacturer of refillable fuses, Pittsburgh, Pa., announces that the Oriental Electric Industrial Corporation of Nagoga, Japan, is closing a deal for a sole license under the Daum patents in Japan and China. Shigekaten Mori, chief engineer of the Oriental company, has been at the Daum plant getting details. Mr. Mori states that all renewable fuses used in Japan and China are imported and that the company he represents will be the first in the Far East to manufacture renewable fuses.

WILLIAM G. MEROWIT, Buffalo, N. Y., is now representing the following concerns in the western part of New York State and nearby Canada: Monitor Controller Company, Baltimore, automatic motor starters and controllers; Roller-Smith Company, New York, circuit breakers and instruments; Union Electric Manufacturing Company, Milwaukee, manual motor starters and controllers. He will make his headquarters at 716 Ellicott Square, Buffalo. Mr. Merowit has had a varied experience in the application of electrical power apparatus and will specialize along those lines.

THE HOBARTS MANUFACTURING COMPANY, Troy, Ohio, announce that its kitchen machines and mixers are now regular equipment in the United States Navy. Instead of having a separate machine for coffee grinding, dough mixing, vegetable cutting, potato mashing and other culinary operations, it is possible by the Hobart unit and attachment system to use only one motor, with which it is possible to perform these operations by using various attachments. This, the manufacturers say, is exceptionally welcome on shipboard, where space is at a premium.

THE MORAN & HASTINGS MANUFACTURING COMPANY, 16 West Washington Street Chicago, has equipped the Emergency Fleet Corporation offices with more than 2000 of its new "Raymo" adjustable lighting fixtures, which are also suitable for store lighting. These fixtures, which have but recently come on the market, have a shade supported from the holder, the bowl being suspended from the husk. Both light rays and lamp sizes may be varied to suit individual requirements since the lamp socket may be moved up and down. The glassware in these units is translucent, while the chain and canopy are finished in Roman gold.

CHAMPION & RYAN, a new concern, have opened an office at 299 Broadway, New York City, and will act as manufacturers' representatives for export trade, with connections in several countries. The company's lines for export will comprise automobile shoes and tires, nitrogen and tungsten lamps, time switches, etc. Mr. Champion was formerly manager of the engineering division of H. Boker & Company, 101 Duane Street, New York City, and Mr. Ryan was associated with him as assistant. Previous to this, Mr. Champion was president of the Kandem Electric Company, Inc., New York City, which company was later absorbed by the Menominee Electric Manufacturing Company. The firm will also act as manufacturers' representative for local trade, which will embrace the territory belonging to the cities of Boston, New York and Philadelphia.

Trade Publications

MOTOR GRINDER.—The F. & M. motor grinder is the topic of a folder issued by Forbes & Meyer of Worcester, Mass.

GRINDERS.—Portable radial grinders are described in a recent bulletin of the Mummert-Dixon Company, Hanover, Pa.

CHURN.—A folder about the "Reliable" electric churn has been prepared by the Piedmont Electric Company of Asheville, N. C.

MARINE FITTINGS.—H. S. Tuttle, 766 Folsom Street, San Francisco, Cal., has prepared leaflets on electrical marine fittings.

STONE POLISHER.—A folder of the Cavicchi Polishing Machinery Company of Quincy, Mass., describes its litho stone polishers.

FUEL OIL.—Much information useful in fuel problems is given in "Fuel Oil and Its Use," published by Tate, Jones & Company, Inc., of Pittsburgh, Pa.

SEWING LAMP.—The American Lamp Company, 506 South Wabash Avenue, Chicago, is distributing a broadside regarding its "Eye-Ease" sewing lamp.

BOWL HANGER.—The Standard Electric Company, Inc., Cedar Rapids, Iowa, is distributing a folder about its "Stelco" bowl hanger for lighting fixtures.

FITTINGS.—Catalog No. 2 from the Efficiency Electric Company of East Palestine, Ohio, describes electrical fittings for structural, mill and general use.

GLUE-POT WARMERS.—Advance-Toledo electric glue-pot warmers form the subject of bulletin 220 of the Advance Machinery Company, Van Wert, Ohio.

NAIL-PACKING MACHINE.—A folder about an electromagnetic nail-packing machine is being distributed by Otto Gamper, 366 West Fifty-seventh Street, New York City.

HOSPITAL SIGNAL SYSTEM.—Leaflets describing the Deveau signaling system for hospitals have been prepared by Stanley & Patterson, 23 Murray Street, New York City.

LIGHTNING ARRESTERS.—The Electrical Engineers' Equipment Company, 710 West Madison Street, Chicago, has distributed a leaflet on sphere-gap lightning arresters.

TURBO BLOWERS.—A new catalog containing figures and tables on forced-draft apparatus has been prepared by the Coppus Engineering & Equipment Company, Worcester, Mass.

FUSE LINKS.—The Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago, has prepared a mailing folder about the Economy "drop-out" renewable links.

TURBINE WATERWHEELS.—An illustrated circular on Trump turbines and turbine waterwheels is being distributed by the Trump Manufacturing Company, Springfield, Ohio.

TWIN RADIANT HEATER.—Information about the "American Beauty" twin radiant electric heater has been printed by the American Electrical Heater Company of Detroit, Mich.

MEDICAL APPARATUS.—"Telatherm" high-frequency medical apparatus is described in a folder of the Wappler Electric Company, Inc., 173 East Eighty-seventh Street, New York City.

LIGHT AND POWER PLANT.—The 1918 model "Warnerlite" standard-unit electric lighting and power plant is dealt with in a folder issued by the Warnerlite Company of Davenport, Iowa.

RECTIFIER.—A recent seven-page booklet of the Stahl Rectifier Company, 401 West Jackson Boulevard, Chicago, has for its subject the Stahl rectifier for charging starting and lighting batteries.

RHEOSTAT AND COMPENSATOR OPERATING MECHANISMS.—Bulletin No. 47,702 from the General Electric Company, Schenectady, N. Y., describes the rheostat and compensator operating mechanisms.

FEED WATER REGULATORS.—The Chaplin Fulton Manufacturing Company, Pittsburgh, Pa., has described its complete line of Vigilant feed-water regulators and steam specialties in the 1919 catalog.

BATTERY CHARGING SETS.—The fourth edition of bulletin No. 105, descriptive of its battery-charging equipment for public garages, has been recently issued by the Main Electric Manufacturing Company of Pittsburgh, Pa.

BOILER TUBE CLEANERS.—A general catalog, X-4, giving full descriptions of the company's tube cleaners, accessories and other boiler room specialties, will be furnished upon request to the Lagonda Manufacturing Company, at Springfield, Ohio.

DISCONNECTING SWITCH. — Bulletin No. 1250 of the Electrical Development & Machine Company describes and illustrates the new "Franklin" disconnecting switches with positive locks for sale by the supply department of the Philadelphia Electric Company, Philadelphia.

POWER AND LIGHT PLANTS.—The various types of Western Electric lighting and power plants for farms and isolated buildings are dealt with in a sixteen-page booklet recently prepared by the Western Electric Company, Inc., of 195 Broadway, New York City.

FEED-WATER FILTER AND GREASE EXTRACTOR.—A twelve-page catalog "R" from the Lagonda Manufacturing Company, Springfield, Ohio, speaks of that company's multiple-filtration feed-water filter and grease extractor and shows photos of various power-plant installations.

WASHING MACHINE.—The Syracuse Washer Corporation, Syracuse, N. Y., has issued a leaflet about the model "H" "Easy" vacuum electric washer.

MAGNET CHARGER.—The "Elco" magnet charger is the subject of a folder from the Electric Equipment Company, 1240 South Hope Street, Los Angeles, Cal.

STANDARD UNIT PANELS.—Loose-leaf bulletins 47,131, 47,133 and 47,135A have been prepared by the General Electric Company of Schenectady, N. Y. The first deals with small-plant alternating-current standard-unit panels, while the second and third describe alternating-current standard-unit panels for isolated and small plants.

MOTORS FOR KITCHEN DEVICES.—"Hobartize Your Kitchen" is the title of a sixteen-page booklet, catalog No. 4118, dealing with the motor-driven coffee grinders, kitchen aids, power units and attachments for chopping, mixing, cutting, etc., made by the Hobarts Manufacturing Company, Troy, Ohio. A price list of these devices with revisions up to Oct. 21 has also been issued by the company.

BALL BEARINGS.—A very comprehensive discussion on the construction and application of Hess-Bright ball bearings is contained in a 108-page board-bound book published by the Hess-Bright Manufacturing Company of Philadelphia. It is entitled "Hess-Bright Ball Bearings." The uses of these bearings are well illustrated, and a number of valuable tables are given on the proper bearings for different loads and speeds.

YEAR BOOK.—The Western Electric Company, Inc., 195 Broadway, New York City, has just issued its "Electrical Supply Book for 1919," which follows similar lines to those of its four predecessors, although it is a little more compact, containing 1120 pages. Manufacturers' list prices are given, from which, with a few exceptions, a uniform discount is allowed. In addition to descriptions and illustrations of the thousands of products marketed by this company, there is included for the convenience of the dealer a catalog of the various Western Electric sales helps and also twenty-three pages of very useful electrical formulas, rules and tables.

New Incorporations

THE KENTUCKY LAMP COMPANY of Owensboro, Ky., has been incorporated with a capital stock of $100,000, by Roy Burlow, M. E. Pierson and H. F. Coombs.

THE HARDING ELECTRICAL COMPANY of Brooklyn, N. Y., has been incorporated with a capital stock of $5,000 by L. H. Harding, 241 Quincy Street, Brooklyn, and others.

THE CRAWFORD ELECTRICAL CONSTRUCTION COMPANY of New York, N. Y., has been incorporated, with a capital stock of $5,000, by S. Berliner, J. Wolf and J. L. Diamond, 1789 Broadway, New York, N. Y.

THE PLAINFIELD STORAGE BATTERY COMPANY has been incorporated with a capital stock of $50,000 to manufacture storage batteries, etc. The incorporators are: J. S. Rifley, Edward J. Way and A. C. MacIntosh of Plainfield.

THE GENERAL EQUIPMENT COMPANY of Hornell, N. Y., has been chartered by A. R. Palmer, F. R. Serles and H. G. Wenzel of Woodhaven. The company is capitalized at $50,000, and proposes to manufacture electric generating equipment.

THE WISCONSIN PEERLESS STARTER COMPANY of Milwaukee, Wis., has been incorporated by Henry Messmer, William O'Connor and E. Van Boo. The company is capitalized at $10,000 and proposes to manufacture gas-engine-starting devices and other accessories.

GEORGE DUBUCS, INC., of New York, N. Y., has been incorporated by G. B. Smith, G. H. Woods and W. M. Mulloch, 473 West 141st Street, New York City. The company is capitalized at $25,000, and proposes to manufacture and repair magnetos and parts.

THE S. D. HARTTOG MANUFACTURING COMPANY, 2638 Locust Street, St. Louis, Mo., has been chartered with a capital stock of $20,000, to manufacture piston rings, patented dies for electrical machines and specialties for the motor-truck trade. The incorporators are: S. D. Harttog, president; John E. Winter, secretary and treasurer, and Henry Till, vice-president.

New England States

RUMFORD, ME.—Work is under way on the construction of a new dam for the Rumford Falls Power Company which will make available for manufacturing and other purposes 10,000 hp. in addition to the 20,000 hp. already developed. The cost of the dam is estimated at $2,000,000. Power will be supplied to the Maine Power Sales Company.

PORTSMOUTH, N. H.—The power plant of the Portsmouth, Dover & York Street Railway Company at South Berwick Junction was recently destroyed by fire, causing a loss of about $5,000.

EAST PEPPERILL, MASS.—The Nashua River Paper Company of East Pepperill is building a 3000-kw. electric generating plant just below its mill on the Nashua River. Three 1000-kw. vertical turbines with concrete penstocks will be installed. It is proposed to equip the mill, which is now operated by steam and mechanically used water power, for electrical operation.

FALL RIVER, MASS.—Plans have been filed by the Stevens Manufacturing Company for the erection of an electric building, 20 ft. by 45 ft., one story, at its plant.

LEOMINSTER, MASS.—The Leominster Electric Light & Power Company has been granted permission to erect transmission lines across Lancaster Street.

MILFORD, CONN.—The Laurel Beach Association has decided to substitute electricity for gas for street lighting. The service is furnished from Milford.

NEW LONDON, CONN.—The Connecticut Power Company has acquired nine building lots near Riverside Park on which it proposes to erect a high-t-ension transmission line to connect with the substation of the Shore Line Electric Railway Company in Williams Street. Viggo E. Bird is manager of the company.

PUTNAM, CONN.—Plans have been prepared by the Cochran Manufacturing Company, 56 Barrett Avenue, Malden, for the construction of a new power house, transmission system and dam at its local properties.

SALISBURY, CONN.—Plans have been filed by the Central New England Railroad Company, controlled by the New York, New Haven & Hartford Railroad Company, for the construction of a new engine plant, repair shop, etc., at Salisbury. Contract has been awarded to the H. Wales Lines Company, 134 State Street, Meriden.

Middle Atlantic States

BINGHAMTON, N. Y.—The Binghamton Railway Company has petitioned the Town Board of Fenton for a franchise to construct a line beginning at the northern line of the village of Port Dickinson through Fenton to the Hires plant at Hiresville.

BUFFALO, N. Y.—Plans are under consideration by the City Commission for the installation of a new interconnecting telephone system throughout the city departments.

BUFFALO, N. Y.—The new plant to be erected by the Mayer & Clarkson Company, Comet Avenue, for the manufacture of cold-rolled steel, drill rods, shafting, etc., will be equipped throughout with electrically operated machinery. Individual motor drive will be used for large machine tools.

DANSVILLE, N. Y.—Extensive additions are being made to the plant of the Power Specialty Company in Dansville.

DEPEW, N. Y.—The Buffalo & Depew Railway Company has applied to the Board of Trustees for permission to extend its line in Depew.

MORRIS, N. Y.—The village trustees have granted the Morris Light & Power Corporation permission to construct and operate an electric system in the village of Morris.

NIAGARA FALLS, N. Y.—Plans have been prepared by the Star Electrode Works of the National Carbon Company, Buffalo Avenue, Niagara Falls, for the erection of an addition, 80 ft. by 80 ft., to its works.

NIAGARA FALLS, N. Y.—The Niagara Falls Power Company has filed a petition with the Public Service Commission for an order authorizing an issue of $2,000,000 in bonds reserved under the refunding and improvement mortgage of the Hydraulic Power Company of Niagara Falls. Improvements under way and proposed, it is stated, will cost $4,000,000.

WATKINS, N. Y.—Plans are being prepared by the International Salt Company for an extension to the boiler house at its Glen works, to cost about $15,000.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ASBURY PARK, N. J.—The Atlantic Coast Electric Railway Company, it is understood, will install new electrical equipment at its power plant.

ATLANTIC CITY, N. J.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 12, for conduit and wiring, and lighting fixtures in the United States post office at Atlantic City. For details see Searchlight Section.

BLOOMFIELD, N. J.—Plans are being considered by the International Arms & Fuse Company, Grove Street, for an addition, 38 ft. by 40 ft., to its power house, to cost about $7500.

CLIFTON, N. J.—Extensions to the street-lighting system on Columbia, Getty and Chester Avenues have been approved by the Borough Council.

LAKE DENMARK, N. J.—Plans are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the installation of a new lighting system at the local government station, to cost about $50,000.

MATAWAN, N. J.—Plans have been prepared for the installation of a new fire-alarm system in Matawan.

MORRISTOWN, N. J.—Work has begun by the Central New Jersey Power Company on the construction of a new dam across the Black River, near Chester, in connection with the proposed new hydro-electric plant to be erected by the company at this location. The company was recently incorporated with a capital stock of $125,000.

NEWARK, N. J.—Plans are being prepared by the board of managers of the Isolation Hospital at Soho for the installation of a new ash-conveying system.

NEWARK, N. J.—Arrangements have been completed by the Electrical Appliance Manufacturing Company for the purchase of the plant of the Diehl Manufacturing Company at 820-850 Frelinghuysen Avenue. The company will take possession at once and establish a factory for the manufacture of electrical specialties.

NEWTON, N. J.—Plans are under consideration by the Newton Electric & Gas Company for the installation of additional equipment at its plant.

POMPTON LAKES, N. J.—Plans have been approved by the Board of Utility Commissioners for the proposed extension of the municipal electric light, heat and power plant of the borough of Pompton Lakes, and also for the issue of $56,000 in bonds to pay for the proposed work.

VERONA, N. J.—Plans have been prepared for the erection of a group of one-story hospital buildings at the Essex County Tuberculosis Hospital. Considerable electrical equipment, it is understood, will be required.

BUTLER, PA.—Ground has been broken for the erection of the new power house to be erected for the Imbria Coal Company at Etnaria. The building will be about 40 ft. by 65 ft. and will cost about $10,000.

CONNELLSVILLE, PA.—Plans have been filed for the erection of a new boiler plant at the local properties of the Western Maryland Railway Company.

HARRISBURG, PA.—Plans are under consideration by the City Council for the installation of new boiler equipment at the city filtration plant.

HAUTO, PA.—Contract has been awarded by the Lehigh Navigation Electric Company, Lafayette Building, Philadelphia, to the Phoenix Construction Company, 81 Broadway, New York, N. Y., for extension to its local power plant, to cost about $1,250,000.

LANSDALE, PA.—In an opinion handed down by Judge Swartz at Norristown the court decides that the borough of Lansdale has no legal right to generate electricity to supply the towns of Hatfield and Chalfont, 2 and 7 miles distant respectively, claiming that it is unconstitutional.

LUCINDA, PA.—Work has begun on the construction of a new power house at the properties of the Lucinda Coal Company, to cost about $8000.

MILTON, PA.—The Milton Manufacturing Company has awarded contract to the Cleveland Construction Company, Citizens' Building, Cleveland, Ohio, for construction of power house, 80 ft. by 184 ft., and a one-story building, 50 ft. by 80 ft., at $100,000.

NANTICOKE, PA.—Plans have been prepared by the Liberty Throwing Company for the construction of a new boiler house at its local works, to cost about $8000.

NANTICOKE, PA.—Preparations are being made by the Delaware, Lackawanna & Western Railroad Company for the construction of an addition to the boiler plant, about 50 ft. by 80 ft., and also to remodel the present building. The cost is estimated at about $40,000.

NORTH EAST, PA.—The Electric Materials Company is erecting an addition, 40 ft. by 60 ft., to its plant. The cost is estimated at about $35,000.

SHAMOKIN, PA.—Work is nearly completed on the construction of the electric transmission line connecting the Mount Carmel electric plant with the local power house of the Shamokin-Mount Carmel Transit Company. The two companies were recently consolidated, and it was decided to increase the output of the Shamokin plant and supply energy in Mount Carmel and abandon the power house there. Contracts have been secured to furnish electricity to Natalie Colliery, Kulpmont and Marion Heights Boroughs and Mount Carmel Township. Preparations are being made by the company to install additional machinery at the power station in the western part of the town. When improvements are completed the company will also furnish energy to the Shamokin-Mount Carmel Transit Company, which will close down entirely its plant at Green Ridge.

SHARPSVILLE, PA.—Work has begun on the construction of an addition to the power plant of the Sharpsville Boiler Works, to cost about $80,000.

BALTIMORE, MD.—Contract has been awarded by the Baltimore Car & Foundry Company to the McAleer Construction Company, 15 East Fayette Street, Baltimore, for the erection of a transformer station at its plant at Curtis Bay, to cost about $8,000.

INDIAN HEAD, MD.—Plans have been prepared by the Navy Department for the installation of a new private telephone system at the local government works, to cost about $40,000.

AFFINITY, W. VA.—Plans have been prepared by the Pemberton Coal & Coke Company for the construction of a new power house at its local plant.

CHARLESTON, W. VA.—The Kanawha Collieries Company, National Bank Building, Charleston, it is reported is contemplating the purchase of power plant equipment.

FAIRMONT, W. VA.—The Oldbury Electro Chemical Company, Buffalo Avenue, Niagara Falls, N. Y., has made arrangements with the United States government for operating a new plant at Fairmont, to be used for production for the Chemical Welfare Department. The cost of the plant is estimated at $500,000.

LOGAN, W. VA.—The Guyan Machine Shops would like to receive prices on a 100-kw., 250-volt generator, with engine, switchboard and boiler.

MOOREFIELD, W. VA.—Bonds to the amount of $8,000 have been voted for the installation of an electric lighting system in Moorefield.

WHEELING, W. VA.—The City Council has approved the contract with the Wheeling Electric Company for furnishing electricity for operating the municipal electric system for a period of five years. The municipal generating plant will be closed down.

NEWTON (P. O. NORFOLK), VA.—Contract has been awarded by the Manganese Steel Casting Company to the General Contract Company, Citizens' Bank Building, Norfolk, for the construction of a steel casting plant on an eight-acre site on the Eastern Branch of Elizabeth River. The cost of the proposed plant is estimated at $300,000, and will include pattern and molding shops, furnace-houses, equipped with four electric furnaces, power house, grinding and machine shops, office buildings, shed and 30 cottages for employees, and also construction of wharf. Work on construction will begin about Feb. 1, 1919.

NORFOLK, VA.—The City Council has authorized an issue of $70,000 bonds for improvements to waterworks system, to include replacing wooden filters with concrete filters, installation of 15,000,000-gal. electrically driven pump, wash filter pump, three additional transformers and mechanical controllers for filters, etc. Walter H. Taylor, Jr., is city engineer.

PETERSBURG, VA.—The Petersburg, Hopewell & City Point Railway Company, it is reported, is contemplating building an extension of its railway to Prince George Courthouse.

PORTSMOUTH, VA.—Plans have been submitted by Barclay, Parsons & Klapp, engineers, 60 Wall Street, New York, N. Y., to the United States government for improvements to the ferry system, including slips in Portsmouth and Norfolk, 50-ft. addition to ferry house in Portsmouth, installation of electric lift float for operation of Berkley boats, etc. Contract for the work has been awarded to the George Leary Construction Company.

North Central States

ADRIAN, MICH.—Henry Ford & Son of Detroit, it is reported, will establish a tractor plant in Adrian. The proposed plant will be erected on the Red Mill site, and the White Mill site will be used for a power plant.

HAMTRAMCK, MICH.—Contracts have been awarded by the Michigan Smelting & Refining Company for an addition to its plant and for construction of power plant, to cost about $10,000. Work has begun on the erection of an addition, 110 ft. by 140 ft., two stories, to cost about $100,000.

ADA, OHIO.—The property of the Ada Water, Heat & Light Company has been sold to the Ada Natural Gas & Fuel Company. A number of improvements will be made to the plant by the new owners in order to furnish a better lighting and heating service.

AKRON, OHIO.—The Capital Issues Committee has approved a bond issue of $47,000 for extensions and improvements to the fire and police alarm signal systems. C. W. Baum is safety director.

CLEVELAND, OHIO.—Plans have been prepared for the construction of a new power house in connection with the proposed extensions to the Harvard Avenue plant of the Aluminum Castings Company. F. A. Parkhurst is architect.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 216, City Hall, Cleveland, until Dec. 5 for furnishing, repairing, maintaining and furnishing current for electric lamps for street lighting in the city of Cleveland for the year beginning Jan. 1, 1919. Bids will also be received until Dec. 5 at Room 219, City Hall, for 14-in. boulevard glass globes for the street-lighting division. Bids will also be received on the same date at Room 218, City Hall, for ornamental glass globes for park and boulevard lamps for street-lighting division. Specifications may be obtained at the office of the superintendent of street lighting, Room 436, City Hall.

HAMILTON, OHIO.—Plans have been prepared by Fred G. Mueller of Hamilton for the proposed tractor plant for Henry Ford & Son, to be erected in this city. A hydroelectric plant, it is understood, will be built to supply power for the proposed plant.

SANDUSKY, OHIO.—The Farrell-Cheek Steel Foundry Company is planning to increase the output of its plant and will install an electric furnace.

MADISONVILLE, KY.—Work has begun on the construction of the new power plant of the St. Bernard Mining Company at Loch Mary, which will furnish power for nine of the company's mines, besides lighting a number of mining towns. The company will also supply electricity for lamps and motors in Earlington. Rights-of-way for its proposed transmission lines have been secured by the company.

INDIANAPOLIS, IND.—The Van Camp Packing Company, Shelby Street, is planning to erect a power house at its plant.

NORTH MANCHESTER, IND.—The capital stock of the Brown Mills Electric Company has been increased from $25,000 to $68,000.

SEYMOUR, IND.—A committee representing the Commercial Club and citizens of Seymour has applied to the Indiana Public Service Commission for permission to purchase the local power plant of the Interstate Public Service Company. The commission will be asked to make an appraisal of the property. The city contemplates purchasing the property and leasing it to an operating company financed by local capital.

WARSAW, IND.—New coal-handling devices are being installed in the main power station of the Winona Interurban Railway Company at Winona Lake.

CHICAGO HEIGHTS, ILL.—The Armour Fertilizer Works, it is reported, is planning to erect a plant, to cost about $500,000, in Chicago Heights.

DURAND, ILL.—The Citizens' Utilities Company has increased its capital stock from $5,000 to $40,000.

MILWAUKEE, WIS.—The Industrial Controller Company, 866 Greenbush Street, Milwaukee, has engaged Henry C. Hengels, architect, First National Bank, to prepare plans for addition to its plant, to cost about $15,000. The company manufactures electric controlling devices. Charles G. Welch is president.

OCONTO, WIS.—The Holt Hardwood Company has applied for permission to make improvements and extensions to its factory and steam generating plant. Considerable new equipment will be required.

SUPERIOR, WIS.—At an election held recently the proposal to purchase the plant of the Superior Water, Light & Power Company, to be owned and operated by the municipality, was carried. The franchise of the company expired several months ago, and an application for a renewal has been before the city officials for some time.

ST. PAUL, MINN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 19 for alterations in conduit and wiring and lighting fixtures in the United States Custom House, St. Paul, Minn. For details see Searchlight Section.

STOCKTON, MO.—The Humansville Electric Light Company is contemplating extending its electric transmission line from Caplinger Mills to Stockton, a distance of 8 miles. L. L. Mathis is secretary.

ASHLEY, N. D.—The Ashley Electric Company is planning to install a 200-hp. Corliss engine. S. P. Waage is manager.

MADISON, S. D.—Bonds to the amount of $100,000 have been voted for rebuilding the municipal electric light plant.

LOUISVILLE, KAN.—The City Council has granted the Riverside Light, Power & Gas Company of Abilene a franchise to install and operate an electric lighting system in Louisville.

OSBORNE, KAN.—Arrangements have been made by the City Council whereby the municipal electric light plant will supply electricity to the towns of Portis, Harlan, Gaylord and Cedar. These towns will erect an electric transmission line to Osborne and provide funds for installing switchboard and other equipment at power plant.

Southern States

GREENSBORO, N. C.—The Southern Truck & Car Company, recently incorporated, is contemplating establishing a new plant in Greensboro for the manufacture of trucks and tractors, to cost about $200,000. J. A. Norfolk is president and manager.

PARIS ISLAND, S. C.—Plans have been prepared by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for extension to power house and heating system at Paris Island, to cost about $97,000 (Specification 3666).

AUGUSTA, GA.—Plans are under consideration by the City Engineering Department for extensions to the municipal waterworks system, to cost about $350,000, including the installation of new pumping machinery and auxiliary equipment.

FORT BENNING, GA.—Contract has been awarded by the United States government for electrical work at Fort Benning, near Columbus, including the erection of an electric transmission line, 8 miles long, to T. H. McKinney of Atlanta, Ga. The cost is estimated at about $1,000,000.

ANNISTON, ALA.—Contract has been awarded by the War Department, Washington, D. C., to T. C. Thompson & Brothers, Charlotte, N. C., for the erection of additional wooden barracks at Camp McClellan, to cost $4,500,000.

BAY SPRINGS, MISS.—The Bay Springs Electric Company is planning to repair its plant, recently damaged by fire. New equipment, it is understood, will be required, including a generator. O. E. Ford is manager.

OIL CITY, LA.—The Oil City Electric Light & Power Company contemplates extensions to its plant to supply additional service in the towns of Oil City and Mooringsport.

JEFFERSON, OKLA.—Contract has been awarded to the Burrell Engineering Company of Chicago, Ill., for the construction of a flour and feed mill for the Morrison Brothers Mills, recently organized in Jefferson. The plans provide for an expenditure of about $150,000 and will include a six-story building, 66 ft. by 36 ft., and a power plant, 36 ft. by 36 ft. Machinery for the proposed plant, it is understood, has been purchaesd. C. J. Morrison is secretary and manager.

GALVESTON, TEX.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is planning to erect shop and industrial buildings at Galveston, to cost about $270,000 (Specification 3675).

RIO GRANDE, TEX.—Plans are under consideration by F. R. and E. D. Radcliffe for the installation of a pumping plant on the Rio Grande River for the purpose of irrigating a tract of about 514 acres.

Pacific and Mountain States

ANACORTES, WASH.—The Morrison Mill Company is installing a new power house in which it will install a new steam turbo-generator unit. The machinery is being installed by the Allis-Chalmers Company.

SEATTLE, WASH.—Plans have been completed by the Smelters Steel Company, White Building, Seattle, for the erection of a building 90 ft. by 100 ft. The equipment will include large electric furnaces.

SEATTLE, WASH.—Plans have been completed by the Puget Sound Traction, Light & Power Company for re-roofing its lighting station at 4237 Seventh Avenue, recently damaged by fire. The cost is estimated at about $10,000.

TACOMA, WASH.—Plans are being prepared by City Engineer Manley for double-tracking the municipal tideflats car line. The cost of the work is estimated at $250,000. Bids for the work will be asked for.

YAKIMA, WASH.—Extensions and improvements to the Yakima reservation drainage and distribution systems, involving an exepnditure of about $500,000, are under consideration by the United States Reclamation Service of Yakima. About 20,000 acres will be reclaimed; two pumping plants of 4500 gal. capacity will be installed and several concrete structures erected.

ASTORIA, ORE.—The Port of Astoria Commission has voted to engage an engineer to prepare a complete report on the available water power in the state, together with the probable cost of transmitting electricity to Astoria in quantities sufficient to meet the present needs of the industrial plants and also to provide for future needs of the city. The Port of Astoria plans to prepare a bill for presentation at the January session of the Legislature giving the port jurisdiction to expand its powers.

LOS ANGELES, CAL.—Steps have been taken by the Public Service Commission for the construction of power plant No. 2 in the San Francisquito Canyon. The new plant will add at least 28,000 hp. to the city's aqueduct power resources and will cost about $1,250,000. The commission has decided to start work at once on construction of pipe line and penstocks, which will lead the water from the outlet of the tunnel from power plant No. 1 to the power house at the foot of the 505-ft. drop. The cost of the pipe line and penstocks is estimated from $50,000 to $100,000. William Mulholland is chief engineer of the aqueduct, and E. F. Scattergood is chief engineer of the power bureau.

SAN FRANCISCO, CAL.—The War Industries Board has approved the application of the city of San Francisco to expend $17,000,000 on the power division of its Hetch-Hetchy domestic water project.

Canada

VANCOUVER, B. C.—A bylaw has been passed by the City Council providing for installing ornamental lamp standards in certain sections of Granville and Pender Streets. The cost is estimated at about $9000.

LEASIDE, ONT.—Work, it is reported, will soon start on the erection of an electric transmission line for the Leaside Munitions Company. The cost is estimated at about $30,000.

SAULT STE. MARIE, ONT.—The Algoma Steel Corporation of Sault Ste. Marie is contemplating the purchase of a centrifugal pump with a capacity of 1500 gal. per minute, directly connected to a 2200-volt, three-phase, 25-cycle motor.

TORONTO, ONT.—Plans are under consideration by the Campbell Flour Mills Company, Cawthra Avenue, for the erection of an elevator at Cawthra Avenue and Junction Road, to cost about $130,000.

14,546 (reissue). SOCKET; Herman G. Pape, New York, N. Y. App. filed May 25, 1918. Will not injure person handling socket even if it is wet.

14,539 (reissue). SYSTEM OF MOTOR CONTROL; Samuel H. Keefer, Plainfield, N. J. App. filed Oct. 19, 1916. For controlling electrically driven machine tools such as planers.

14,540 (reissue). PLANER AND SYSTEM OF MOTOR CONTROL THEREFOR; Samuel H. Keefer, Plainfield, N. J. App. filed Oct. 19, 1916. For stopping motor at any time from any part of apparatus.

1,281,907. CURRENT TAP; Frank V. Burton, Bridgeport, Conn. App. filed Nov. 27, 1915. May be applied to various fittings of standard type to afford detachable connection for branch circuit.

1,281,917. SEAL; Earl E. Eby, Wilkinsburg, Pa. App. filed Dec. 29, 1915. For forming a hermetic joint between vitreous material and bodies of metal.

1,281,952. PROCESS AND APPARATUS FOR DEHYDRATING EMULSIONS; Ford W. Harris, Los Angeles, Cal. App. filed April 4, 1917. Smaller particles of water are agglomerated to facilitate settlement.

1,281,955. EXCITING SYSTEM FOR PHASE CONVERTERS; Rudolf E. Hellmund, Swissvale, Pa. App. filed Aug. 7, 1916. Relates to the T-connected, rotary type.

1,281,956. PHASE-BALANCING SYSTEM; Rudolf E. Hellmund, Swissvale, Pa. App. filed Aug. 10, 1916. For alternating-current distribution wherein three-phase currents are derived from a single-phase source by means of a phase converter.

1,281,959. REGENERATIVE BRAKING; George H. Hill, Schenectady, N. Y. App. filed Sept. 18, 1916. Direct-current motor may be retarded by causing it to act as a generator to return energy to the line.

1,281,962. FUEL MIXER; Glenn R. Holland Genesee, Ill. App. filed Nov. 8, 1917. For generating gas by electrical decomposition of water to form fuel for engine.

1,281,983. PROCESS FOR MAKING ALKALI PERBORATES; Otto Liebknecht, Frankfort-on-the-Main, Germany. App. filed Feb. 29, 1916. Relates to electrolytic production of alkali perborates in the presence of certain electrodes possessing properties favorable for such electrolysis.

1,282,010. LOCKING DEVICE FOR IMPULSE STARTERS; Frederick W. Andrew, Brooklyn, N. Y. App. filed June 29, 1918. For enabling device to be used as a coupling in case of accidental breaking of spring, to start engine.

1,282,017. MOTOR-CONTROL SYSTEM; George E. Stack, Schenectady, N. Y. App. filed July 24, 1918. Involving use of electromagnetic switches or contactors of the "lock-out" type.

1,282,019. SPARK DISTRIBUTER FOR INTERNAL-COMBUSTION ENGINES; Ellis D. Allensworth, Waukegan, Ill. App. filed Oct, 27, 1917. Of dual construction, one method better adapted for starting and the other for normal operation.

1,282,027. BRUSH FOR ELECTRICAL MACHINERY; Oliver E. Becker, Oak Park, Ill. App. filed March 11, 1918. For preventing spreading or fraying of gauze brush without resilience, springiness or ventilation.

1,282,029. PROCESS FOR MAKING RESISTER PLATES; Arthur S. Bemis, Cleveland, Ohio. App. filed April 22, 1914. Method of applying coating of protective material.

1,282,038. ELECTRIC IRON; George Bullock and Arthur E. Templeman, Grand Junction, Col. App. filed Dec. 8, 1917. Device for supporting cord out of operator's way.

1,282,039. ELECTRIC IRON; George Bullock and Arthur E. Templeman, Grand Junction, Col. App. filed Dec. 8, 1917. Means for preventing displacement of support for cord.

1,282,057. ELECTRIC BATTERY; Raymond William, Fremont, Ohio. App. filed Nov. 30, 1915. A negative element consisting of copper oxide and sulphur in electric batteries containing an alkaline electrolyte and zinc electrode.

1,282,070. COMB; Edward D. Green and Emily M. Scott, Chicago, Ill. App. filed June 28, 1918. With heater to straighten out curls in wool or hair.

1,282,086. STATIONARY INDUCTION APPARATUS; Svend E. Johannesen, Pittsfield, Mass. App. filed May 2, 1917. To provide a better central-core construction for transformers, etc.

1,282,101. BRUSH CONNECTION; Arthur R. Miller, Cleveland, Ohio. App. filed Dec. 14, 1916. Flexible conductor is secured directly to carbon block.

Record of Electrical Patents

Notes on United States Patents

1,282,114. COMBINED V-TYPE ENGINE AND MAGNETO; Richard A. Oglesby, South Bend, Ind. App. filed April 14, 1917. Every portion of its cycle of rotating to be absolutely asynchronous with movement of engine crank shaft.

1,282,122. PROCESS FOR THE PRODUCTION OF DUCTILE TUNGSTEN; Carl A. Pfanstiehl, Waukegan, Ill. App. filed July 12, 1915. Single furnace used in welding treatment.

1,282,130. ELECTROPNEUMATIC BRAKE MECHANISM; James R. Sloan, Howard E. Perry and Ira V. Goodman, Altoona, Pa. App. filed April 1, 1918. Requires use of only a single train wire without special connections between cars.

1,282,132. AUTOMATIC ELECTRIC SWITCH; Louis A. M. Phelan, Chicago, Ill. App. filed Sept. 27, 1915. For use in connection with intermittently flashing electric signs.

1,282,133. ELECTRODE HOLDER FOR SEARCHLIGHTS; Elmer A. Sperry, Brooklyn, N. Y. App. filed April 16, 1915. Heavy current is handled within lamp without damage to electrodes.

1,282,159. ELECTRIC STORAGE BATTERY; James A. Wood, Philadelphia, Pa. App. filed Jan. 25, 1918. Construction of electrode grid and non-metallic acid-resistant insulating means to separate and insulate positive from negative plates.

1,282,178. FLOAT-CONTROLLED CIRCUIT CLOSER; Wilfrid J. Bousquet, Woonsocket, R. I. App. filed April 11, 1917. Particularly for use in refrigerator alarms.

1,282,195. ELECTRIC OVEN; Jay D. Crary, Aberdeen, Wash. App. filed Oct. 10, 1917. Heater connected independent of oven so that heater may be moved and used for other purposes.

1,282,208. METHOD OF MANUFACTURING ELECTRICAL CABLES; Henry W. Fisher, Huguenot Park, N. Y. App. filed June 18, 1917. Insulating compound having desired physical and dielectric properties incorporated in insulating material entering into cable structure.

1,282,219. PORTABLE SIGNALING SEARCHLIGHT; William Grether, Dayton, Ohio. App. filed Feb. 11, 1918. Tilting lamp housing may be revolved in complete circle for airplane signaling.

1,282,221. REGULATOR; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed March 26, 1914. To govern electrically controlled devices in response to temperature variation.

1,282,238. DEVICE FOR OPERATING X-RAY APPARATUS; William Kleinberg, New York, N. Y. App. filed Aug. 10, 1916. Adapted to be employed with either alternating or direct current.

1,282,242. ELECTRICAL HEATING UNIT; Frank Kuhn and Jay A. Hand, Detroit, Mich. App. filed Feb. 21, 1918. Of the exposed resistor types.

1,282,243. ELECTRIC AIR HEATER; Frank Kuhn, Detroit, Mich. App. filed April 6, 1916. Detachable heating unit permits ready repair or renewal.

1,282,257. TELEPHONE-EXCHANGE SYSTEM; Talbot G. Martin, Chicago, Ill. App. filed Jan. 12, 1906. Relates to automatic or semi-automatic telephone systems.

1,282,259. METHOD OF PRODUCING METAL-SURFACED ARTICLES; Matthew M. Merritt, Danvers, Mass. App. filed Dec. 3, 1915. For electrolytically depositing metal on a core of other material.

1,282,261. GALVANOPLASTIC METHOD AND APPARATUS; Matthew M. Merritt, Danvers, Mass. App. filed March 29, 1917. Copper deposited on a permanent metallic mandrel coated with mercury amalgam.

1,282,262. ELECTROLYTIC PROCESS; Matthew M. Merritt, Danvers, Mass. App. filed June 27, 1917. Pertains particularly to manufacture of copper or other metallic sheets by electrodeposition on a rotating cathode.

1,282,263. ELECTROLYTIC PROCESS; Matthew M. Merritt, Danvers, Mass. App. filed June 27, 1917. Pertains particularly to processes of depositing copper on rotating cylinders or mandrels wholly or partially immersed in electrolyte.

1,282,264. ELECTROLYTIC PROCESS; Matthew M. Merritt, Danvers, Mass. App. filed June 27, 1917. Relates to separating deposited metallic sheets from mandrel to form continuous sheets.

1,282,268. ELECTROLYTIC PROCESS AND PRODUCT; Matthew M. Merritt, South Middleton, Mass. App. filed Nov. 2, 1917. Useful as applied to electrolytically coating with copper the surface of aëroplane propellers.

1,282,269. GALVANOPLASTIC PROCESS AND PRODUCT; Matthew M. Merritt, South Middleton, Mass. App. filed Nov. 2, 1917. Pertains to manufacture of manifolds for internal-combustion engines such as aëroplane engines.

1,282,270. ELECTROLYTIC PROCESS AND PRODUCT; Matthew M. Merritt, South Middleton, Mass. App. filed Nov. 2, 1917. Pertain to manufacture of aëroplane propellers formed of non-conductive materials and coated with electrolytically deposited metal.

1,282,276. ELECTROMAGNET; Leonard D. Morris, Chicago, Ill. App. filed Sept. 17, 1917. Armature may be moved in substantial parallelism with adjacent face of magnet core and may be kept out of actual sliding contact with core.

1,282,317. OUTLET BOX; Irijah A. Terrell, New York, N. Y. App. filed March 12, 1913. May be used in walls, ceilings, floors and other places.

1,282,330. SYSTEM OF ELECTRIC HEATING; Tycho Van Aller, Schenectady, N. Y. App. filed May 11, 1918. Variety of degrees of heat may be obtained without external resistance in one continuous heating element.

1,282,380. METHOD OF FORMING SECONDARY WINDINGS OF HIGH-TENSION COILS; F. W. Cotterman, Dayton, Ohio. App. filed Sept. 2, 1916. Wire and insulating material are applied to coil simultaneously and continuously until secondary winding is completed.

1,282,383. ELECTRIC WIRE CLAMP; Edson S. Damon, Council Bluffs, Iowa. App. filed Sept. 27, 1915. To obviate necessity of removing insulation.

1,282,388. ELECTROMECHANICAL MAKE-AND-BREAK MOVEMENT FOR ELECTRIC CIRCUITS; Francois de d'Hamale, Enfield, England. App. filed Dec. 27, 1917. Break is produced by inertia of a weight secured at end of a spring.

1,282,415. PROCESS OF LEACHING COPPER ORES; Albert W. Hahn, El Paso, Tex. App. filed Jan. 19, 1915. Method of recovering copper by electrolysis of copper solutions.

1,282,426. RELAY; Lee P. Hynes, Chicago, Ill. App. filed Nov. 1, 1912. Designed to be durable and carry comparatively small currents.

1,282,430. AUTOMOBILE SIGNAL DEVICE; Laurence E. Jones, Liberty, Mo. App. filed Feb. 11, 1916. Mounted on rear of car to indicate change of course.

1,282,439. SYSTEM FOR AMPLIFYING VARIABLE CURRENTS; Irving Langmuir, Schenectady, N. Y. App. filed Oct. 29, 1913. Includes means for securing selectivity in detecting signals.

1,282,445. PROCESS OF PRODUCING GAS; Ben. F. McKee, Arma, Kan. App. filed Dec. 12, 1917. Electric arc used to produce gas from coal or other carbonaceous materials.

1,282,475. MANUFACTURE OF CARBON ELECTRODES; Sven E. Sieurin, Hoganas, Sweden. App. filed Oct. 16, 1917. Carbonaceous raw material is also heated in an electric resistance furnace.

1,282,476. ELECTRIC FLUID HEATER; Maurice Simon, St. Louis, Mo. App. filed July 14, 1917. Primarily adapted to be supported by wall in hot-water storage tank.

1,282,481. MULTIPLE-SECTION SUSPENSION INSULATOR; Sol. S. Sonneborn, Brooklyn, N. Y. App. filed Feb. 10, 1917. For high-potential transmission lines.

1,282,487. BOTTLE-MAKING MACHINE; Richard O. Stilwell, Tarentum, Pa. App. filed Aug. 4, 1914. Relates particularly to machines wherein a blank is formed in one part of the machine from a portion of glass and subsequently blown into a finished bottle by another part of the machine.